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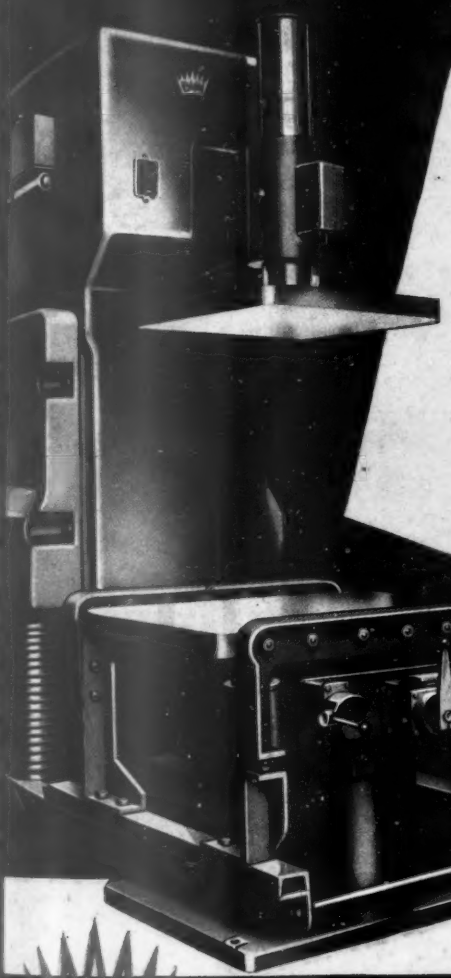

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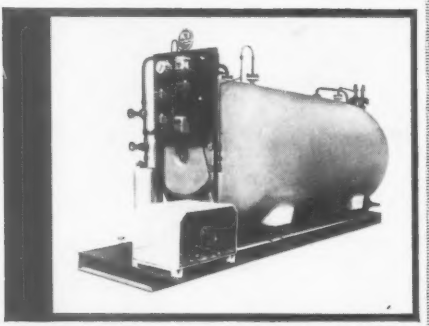

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FOUNDRY TRADE JOURNAL

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Foundry Industry of Sweden

There are about 400 foundries in Sweden, many of which are quite small. Thus, there are 150 foundries (iron and non-ferrous) in the employers' federation, but no steel foundries, as these associate themselves with the iron and steel industry. We always thought that the Royal Metallographic Institute in Stockholm was the research organization for iron and steel industry, but find that to-day, four-sevenths of the necessary finance comes from the ironfoundry industry, one-seventh from non-ferrous and the remainder from iron and steel interests. The arrangement at the Institute—which is magnificently equipped—is that the foundry industry has its own section for research and development work and operates laboratories for the melting of metals (using high-frequency induction methods), and applies sand testing and so forth. For fundamental research, there is close co-operation with the steel section. For instance, an electron microscope is available, together with an experimental automatic spectrograph which is rapidly approaching the potentialities of the conventional machines for the rapid analysis of metals.

The standard of living is extremely high in Sweden—on an average one car for every eight people living there—yet only one garage for every ten cars. Thus, the streets of Stockholm are, during the night, littered with parked cars. Whilst the Swedish car firm "Volvo" makes a substantial contribution to the local market, especially for provision of heavy lorries—practically every other make of car is encountered. Agriculture is highly mechanized, though there is still room for the sale of tractors and agricultural machinery, but here, too, the competition is fierce.

Sweden's industry is expanding—too quickly, some Swedes think. It is now attracting immigrants from the Baltic States and Italy. To meet this situation, the Swedish foundry industry has responded excellently. It now ranks as the fifth largest foundry industry in Europe. The production of iron castings is of the order of 350,000 *tonnes* per annum, that of steel castings 30,000, non-ferrous 20,000, and malleable 20,000 *tonnes*. The foundry employers' federation serves the needs of its members through the work of no fewer than 35 committees. The executive head of this federation is Mr. Lars Villner, who is organizing, or, rather, has already organized, the forthcoming International Foundry Congress. To him, we are indebted for supplying most of the statistics quoted and also for the efficient planning of the Editor's tour through Scandinavia.

JOHN BLAKISTON, M.I.Mech.E.
President-elect, Institute of British Foundrymen

Featuring . . . .

JOHN BLAKISTON, M.I.Mech.E.

JOHN BLAKISTON has engineering in his blood, as his grandfather worked with Stephenson on early railway developments. He received his earliest training at the Middlesbrough High School* and his first job was as an apprentice at the Clarence Iron Works of Bell Bros., Limited. He became interested in foundrywork when this firm amalgamated with Dorman Long & Company, Limited, and amongst his other duties he became responsible for making some 400 tons of both ferrous and non-ferrous castings per week. Upon being made manager of Modern Foundries, Limited, Halifax, where the weekly output was about 100 tons per week, he took on a much more exacting type of casting. This period covered war time and his use of female labour for moulding received much publicity. By 1946, he started practice as a consultant and is now retained by concerns as widely separated as Malaya, India, and the West Indies, as well as by several well-known UK groups. Lately, Mr. Blakiston has been giving more attention to the installation of electric melting furnaces, as he is convinced that this method will eventually supersede more orthodox methods using cupolas and crucibles.

Mr. Blakiston, who is president designate of the Institute of British Foundrymen, is also a member of the Institution of Mechanical Engineers and the Institution of Production Engineers. In recent years, he has been admitted to the Livery of the Worshipful Company of Founders and the Freedom of the City of London. He has made many contributions to the literature of foundry practice, an outstanding article being "Fifty Years of Foundry Plant and Equipment," printed in the Golden Jubilee issue of this JOURNAL. His interest in education started when he was a member of the original advisory committee of the Constantine College, Middlesbrough, and has become extremely wide with the passing of time. He now serves on the foundry committee of the City and Guilds of London Institutes. Whether or not he holds the time record for the creation of a British Standard is not certain, but it is a fact that as chairman of the appropriate BSI committee, he dealt with the proposed standard for moulding boxes in two meetings. In another case during the early 'twenties, following the complete gutting by fire of a large patternshop, Mr. Blakiston organized its complete reconstruction from the ground to full operation within six weeks. In the depression of the late 'twenties it is significant that the foundries for which Mr. Blakiston was responsible all built up their productivity and extended their employment.

Mr. Blakiston is a director of two foundry concerns, W. Richards & Sons, Limited, and the Sandholme Iron Company, Limited. His consulting practice, which now includes that of adviser to the Government of India for foundry and heavy-engineering matters, leaves but little time for pursuing hobbies, but two or three times a year he sails his 14-ft. three-quarter-deck dinghy on Lake Windermere.

* It is interesting to note that Mr. Frederick Portway Wilson, a past-president of the Institute of British Foundrymen, also attended this school, and in 1906 it was the venue of the third IBF conference.

Luncheon

BRITISH STEEL CASTINGS RESEARCH ASSOCIATION

To mark the official opening of their new laboratories in Sheffield (referred to elsewhere in this issue) the British Steel Castings Research Association held a luncheon party last Tuesday at the Grand Hotel, Sheffield. Mr. C. H. Kain, A.M.I.MECH.E., chairman of the Council, BSCRA, presided and about 100 members and guests attended. Those prominently placed included the Lord Mayor of Sheffield (Alderman A. Ballard), the Master Cutler (Sir Peter Roberts, Bt.), Sir Charles F. Goodeve, G. M. Menzies, Dr. E. Gregory, W. Scott, Professor H. W. Melville, A. H. Catton, Dr. C. J. Dadswell, D. J. Haggie, Professor G. Wesley Austin, H. C. Bradbrook, W. S. Scott, Dr. R. Hunter, Dr. C. J. Smithells, Dr. W. L. Francis, Dr. A. H. Sully (director of the Association), James Jackson, Professor A. R. Clapham, J. Currie, R. J. Richardson, and John Bolton (secretary of the Association). Sir Harry Jephcott, D.SC., F.R.I.C., chairman of the Council of Scientific and Industrial Research, was the chief guest (later in the afternoon he formally opened the laboratories), and he it was who proposed the toast to the success and prosperity of the Association. Mr. Kain responded and in doing so, outlined briefly the history of the Association and thanked the numerous bodies who had helped to bring the laboratories into being, welcoming by name a number of guests who had been specially active in this way.

The company then adjourned to the laboratories in East Bank Road where Sir Harry, after performing the opening ceremony, cast a plaque to commemorate the event. Thanks were also expressed to the director of the Association and his staff for arranging the day's events—which included numerous demonstrations of work in progress.

(After the day's proceedings, the whole of the Association's staff of about 40, with their wives, were guests of Mr. Kain at an informal dinner party held at the Devonshire Arms, Baslow.)

Board Changes

WOODFIELD HOIST & ASSOCIATED INDUSTRIES, LIMITED—Mr. C. E. Carruthers has resigned from the board. Mr. E. L. Fuller has been appointed managing director.

MATTERSON, LIMITED—Mr. R. K. Matterson has been appointed joint managing director. Mr. J. Jackson, works manager, and Mr. M. Miller, head draughtsman, have joined the board.

STOTHERT & PITT, LIMITED—Mr. J. Gourlay and Major-Gen. G. L. Watkinson, directors, have been appointed joint managing directors. Mr. A. V. Kennedy, who has been acting managing director, will continue in office as an executive director.

THE Duke of Edinburgh has agreed to become patron of the council of the festival of films in the service of industry at Harrogate in October.

THE NEED for Common Market plans to go ahead slowly—with time for the adjustment of national economies—was stressed by Mr. A. H. Ingen-Housz, president of the Iron and Steel Institute, speaking at a luncheon given by the Netherlands Chamber of Commerce in London. He said that the Common Market planners had much to learn from the European Coal and Steel Community and the policy of its High Authority.

B & F Golf Meeting

Fast becoming an "institution"—in that it is an annual event to which all those participating hope to be asked again next year—the Bradley & Foster annual golf competition for the McKenna Trophy was held last Friday afternoon at the Whittington Barracks golf course, near Lichfield. There were 47 competitors, many of whom were from foundry and kindred industries, not by any means confined to the Midlands. Excellent playing conditions resulted in good "cards" being returned, though for many it was more of an enjoyable social occasion than an opportunity for serious golf.

After tea at the Golf House, competitors, spectators and other guests, to a total of 100, adjourned to the George Hotel, Lichfield, for dinner at which Bradley & Foster were hosts—the chair being taken by Dr. J. E. Hurst, J.P. Here at the conclusion of the meal, the cup was presented to the winner, Mr. L. Bramhall (who returned a net score of 70) by Mr. H. Taylor, Sheriff of Lichfield. Mr. A. E. Phillips-Dannan was second and Mr. M. B. Morgan third, with 71 and 72 respectively. Alderman H. J. Hall welcomed the guests and Dr. Hurst and Mr. M. Froggatt (both directors of Bradley & Foster, Limited) also spoke.

IBF Conference Fund

The Foundry Trades Equipment and Supplies Association announce that in connection with the Institute of British Foundrymen's annual conference fund the amount contributed by members of the Association totals £310 9s. 0d. The list of subscribers includes:—

Acme Conveyors, Limited; Adaptable Moulding Machine Company, Limited; Wm. Aske & Company, Limited; August's, Limited; F. J. Ballard & Company, Limited; Baker Perkins, Limited; Bradley & Foster, Limited; British Moulding Machine Company, Limited; British Ronceray, Limited; Constructional Engineering Company, Limited; Fordath Engineering Company, Limited; Foundry Plant & Machinery, Limited; FOUNDRY TRADE JOURNAL; General Refractories, Limited; J. W. Jackman & Company, Limited; A. Lakin & Son, Limited; Marco Conveyor & Engineering Company, Limited; Paterson Hughes Engineering Company, Limited; Pneulec, Limited; Rapid Magnetic Machines, Limited; Spencer & Halstead, Limited; Sterling Foundry Specialties, Limited; E. Tallis & Sons, Limited; and Isaac & Israel Walker, Limited.

Increases in Capital

CENTRAL MINING FINANCE, LIMITED, London, E.C.2, increased by £499,900, in £1 shares, beyond the registered capital of £100.

UNIVERSAL STEEL TUBE COMPANY, LIMITED, Birmingham, increased by £60,000, in £1 ordinary shares, beyond the registered capital of £50,000.

PRESSED STEEL COMPANY, LIMITED, Cowley, Oxford, increased by £1,000,000, in 5s. ordinary shares, beyond the registered capital of £6,000,000.

AJAX ARCHITECTURAL PRODUCTS, LIMITED, London, S.E.26, increased by £29,900, in £1 ordinary shares, beyond the registered capital of £100.

COBBLE BROS. MACHINERY COMPANY, LIMITED, Blackburn, increased by £17,900, in £1 ordinary shares, beyond the registered capital of £100.

PRIESTMAN BROS., LIMITED, engineers, etc., of Thomas Street, Hull, increased by £400,000, in £1 ordinary shares, beyond the registered capital of £600,000.

STEEL COMPANY OF WALES, LIMITED, Abbey Works, Port Talbot, increased by £20,000,000, in £1 ordinary shares, beyond the registered capital of £40,000,000.

R. & W. WINTER & COMPANY, LIMITED, coppersmiths, etc., of London, S.E.1, increased by £10,000, in £1 ordinary shares, beyond the registered capital of £5,000.

International Pressure-die-casting Conference

European Pressure Die Casting Committee hold their Second Meeting in Paris, May 20 to 24

Mr. R. L. Stubbs, director Zinc Development Association (UK), shown delivering the inaugural lecture on European developments in pressure-die-casting.

The second International Die Casting Conference, organized jointly by the *Syndicat General des Fondeurs de France* and *La Commission Technique des Alliages de Zinc* for the European Die Casting Committee, was held in Paris from May 20 to 24. Co-operating in the organization and general arrangements were *le Syndicat General des Fondeurs de France, le Centre Technique des Industries de la Fonderie, la Société Zinc & Alliages,* and *l'Aluminium Francais.* The organizing committee had, as honorary presidents, Professor Portevin, *Membre de l'Institut;* Mr. Oliver, president of the *Syndicat General des Fondeurs de France* and of the *Centre Technique des Industries de la Fonderie;* the president was Mr. Seigeot, and the vice-presidents Mr. Brizon, Mr. Chevalier and Mr. Patin, respectively president and three vice-presidents of the *"Fonderie sous Pression"* section of the *Syndicat General des Fondeurs de France.* Members of the committee were Mr. A. Dumas, director of Aluminium Francais; Mr. Denizard, head of the non-ferrous foundry department of the *Regie Nationale des Usines Renault;* and Mr. Stupfler, assistant general director of the *Centre Technique des Industries de la Fonderie.* There was a very strong attendance throughout the conference of delegates from many countries—Germany, Austria, Belgium, Denmark, Spain, Great Britain, Holland, Italy, Portugal, Sweden, Switzerland, United States of America, and Australia. On the second day, four Russian members arrived and contributed to the proceedings of the afternoon session.

Papers Presented

The full list of papers presented and discussed was as follows:—

"Development of Die-casting in Europe," by R. L. Stubbs, director of the Zinc Development Association (England); "The Function of the American Die-casting Institute in an Expanding Die-casting Industry," by Cl. L. Anthony, vice-president of the American Die Casting Institute (USA); "Improved Markets for Zinc Die-casting," by J. L. Kimberley, executive vice-president of the American Zinc Institute (USA); "Manufacture and use of Large Aluminium Die-castings," by Dr. Bauer, chief engineer of the Doehler-Jarvis Division, National Lead Company (USA); "Aluminium Die-castings," by Dr. Bucken, of Karl Schmidt A.G. (Germany); "Die-casting of Small Precision Components," by Mr. Chevalier, director of Ets. Deberny & Peignot (France); "Choosing Alloys for Die-casting," by Dr. Wolf, Metallgesellschaft A.G. (Germany); "Influence of Aluminium in Zinc Die-casting," by L. A. J. Lodder and K. P. Scott, Imperial Smelting Corporation Limited (UK); "Experimental Results on the Influence of Nickel as an Impurity in Zinc Die-casting Alloys," by Dr. E. Varady, Societa Montevecchio (Italy); "Experiences and Problems in the Surface Finishing of Zinc and Aluminium Die-castings," by Dr. Ruegg, Injecta, Limited (Switzerland); "Problems in the Finishing of Zinc-alloy die-castings," by Dr. J. Edwards, British Non-ferrous Metals Research Association (UK); "Applications of Spectography and Polarography in Testing Die-casting Alloys," by Mr. Croissant, head of the laboratory of the Fonderie de Precision de Nanterre, and Mr. Vinaver, head of the laboratory of the Auby factory of the Cie Royale Asturienne des Mines (France); "Spheroidal-graphite Iron in the Die-casting of Zinc and Aluminium Alloys," by L. Oltrasi, Societe Necchi (Italy); "The Unit-die System," by G. Nyselius, president of the Mt. Vernon Die Casting Corporation (USA); "Die Steels for Die-casting," by K. I. Bengtsson (Sweden), and "Experimental Considerations on the Influence of the Die-casting Machine in the Die-casting of Zinc Alloys," by Guastalla, Societa Magneti Marelli (Italy).

At the conclusion of the technical proceedings of the conference, facilities were provided for visits to Fonderie de Precision de Nanterre, Centre Technique des Industries de la Fonderie, Regie Nationale des Usines Renault in Flins, Le Metal Injecté Ateliers Metallurgiques d'Ivry, Ets. Magister, and Ste. Allcasts. A full programme of sightseeing and social events was provided for the ladies; those to which the menfolk were also invited included a river trip on the Seine (with dinner) and the final banquet at the Restaurant des Ambassadeurs. Some personalities of the die-

Personalities photographed during the International Pressure-die-casting conference held in Paris, May 20 to 24:

(*a*) (Left to right) Dr. Bauer and Mr. H. H. Doehler (both of Doehler-Jarvis Divn., National Lead Company, USA, with Mr. Wahl (Director of the Zinc et Alliages concern and secretary of the *Commission Technique des Alliages de Zinc* (France)).

(*b*) (Left to right) Mr. T. O. Reynolds (Sr.) and Mr. F. J. Trevitt (both of Alloy Pressure Die Products Limited), Mr. and Mrs. F. Willetts (W. & T. Avery Limited), Mr. E. A. Morgan and Mr. T. O. Reynolds (Jr.) (Alloy Pressure Die Products Limited) and Charles Lyons (Imperial Smelting Corporation Limited).

(*c*) (Left to right) Ing. J. Weiss (Gruber and Gaja GmbH), P. Honegger (Buhler Freres, Uzvill), with Mr. and Mrs. K. Honsel (Honsel-Werke AG).

(*d*) (Left to right) Mr. Hans Teichmuller (Wintershall Aktiengesellschaft), Mr. Erich Look (Huttenwerke Templehof), Dr. Karl Mattheus (Gesamtverband Deutscher Metallgiebersien), Mr. Wilhelm Voss (Vobra-Spritzguss KS), and Mr. Arthur Grossmann (Wintershall Aktiengesellschaft).

casting world attending these functions are shown in the illustrations accompanying this account.

Other Functions

While the actual opening of the conference took place on the morning of May 21, a reception and cocktail party had been held the previous evening in the Conference Hall. Some pleasing ceremonies took place at the latter function. First Mr. C. R. Maxon (New Jersey Zinc Company), introduced and described an impressive array of die-castings (Figs. 2 to 4) which had been specially brought from America for the occasion. Following him, Mr. Patin (general director of the Fonderie Precision de Nanterre) introduced another interesting display of French die-castings. These exhibits were continually thronged by spectators throughout the meeting. Also, during the inaugural meeting and to the great pleasure of all present, a plaque was presented to Mr. H. H. Doehler to signify the high esteem in which he is held throughout the world and in appreciation of his services to the ever-growing die-casting industry.

The conference was officially opened on May 21 by Professor Portevin, hon. president of the organizing committee, who welcomed all the delegates Mr. F. G. Woollard (a former chairman of the Zinc Alloy Die Casters Association) then introduced Mr. R. L. Stubbs, director of the Zinc Development Association, whose paper was entitled "The Development of Die Casting in Europe."

Development of Die Casting in Europe

By R. Lewis Stubbs, director, Zinc Development Association

Historical

Die-casting had its origins in the printers' type-casting machines which were invented in Germany about 120 years ago, but although die-casting began in Europe, the development of the modern pressure-die-casting process owes a great deal to the ingenuity of the American engineering industry and the readiness of the manufacturers there to accept new processes and products. Since the development of suitable zinc alloys some thirty years ago, expansion has been rapid in the US, where the production of zinc die-castings rose from 17,000 *tonnes** in 1932 (a depression year) to 86,000 *tonnes* in 1939. In the same period, only the British industry was of significant size in Europe, producing some 13,000 *tonnes* of zinc die-castings yearly by 1938. Important individual companies on the Continent were, however, already well known for their excellent products.

During the war there was little development on the Continent, but in the USA and UK many munition parts were made by die-casting and the industry in these two countries was able to achieve some of its most spectacular runs. In three years, British production of zinc die-castings had quadrupled, to exceed 50,000 *tonnes* in 1942.

The US industry, which had expanded steadily during the war, continued to grow, and by 1950 production exceeded a quarter of a million *tonnes* of zinc die-castings per year. In Europe, the changeover took longer and was also hampered by metal shortages. By 1950, however, the pre-war output had been surpassed and the foundations had been laid for the steady and vigorous growth which has been such a feature since then. In Britain, annual production reached 35,000 *tonnes* of zinc die-castings, nearly three times the 1938 level

TABLE I.—*Production of Zinc-alloy Die-castings in Europe and U.S. (thousands of tonnes).*

	1952.	1953.	1954.	1955.	1956.
UK	23.7	27.7	35.8	43.0	36.0
France	8.8	8.5	11.0	13.0	15.0†
Germany	5.7	6.6	9.4	13.6	15.0
Italy	2.8	3.2	3.7	3.9	4.0†
Others	2.0†	3.0†	3.5†	4.5†	5.0†
European total	43.0	49.0	63.4	78.0	75.0
United States	213	275	262	360	320

TABLE II.—*Aluminium-alloy Die-castings Produced in Europe and U.S. (thousands of tonnes).*

	1952.	1953.	1954.	1955.	1956.
UK	9.9	11.7	15.4	18.3	15.0
France	3.9	3.7	5.0	7.0	10.0†
Germany	4.2	5.1	9.5	14.2	14.0
Italy	6.0	6.0	6.2	6.5	7.0†
Others	4	5	5	6	6
European total	28	31·5	41·1	52	52
United States	70	107	100	159	168

* Metric *tonnes* (2205 lb) are quoted throughout this paper
† Partially estimated

French output at some 6,000 *tonnes* per year has also trebled and there was similar expansion in other European countries.

Present-day Statistics

The developments in die-casting up to this time had been largely based on zinc, but by 1950 the output of aluminium die-castings in the US had risen to 76,000 *tonnes* compared with 261,000 *tonnes* of zinc. In Europe some 21,000 *tonnes* of aluminium and 50,000 *tonnes* of zinc die-castings were made in that year. Since the formation of the European Pressure Die Casting Committee in 1953, detailed figures of production by countries have been available, and the development of the industry in the last five years is shown in Table I and II. It is clear that the UK and France, like the US all use by weight about twice as much zinc as aluminium for die-casting, although the recent recession in the motor industry in Britain and the US has affected zinc more than aluminium. In other European countries, including Germany and Italy, the weight of aluminium used in die-casting has for some years been greater than that of zinc but in 1956 zinc regained its lead in Germany, for the first time in four years.

End Uses

Although few statistics on the end uses of die-castings in Europe have been collected, some information has been assembled by the members of the European Pressure Die Casting Committee. This shows that, in the major producing countries, the motor industry is by far the largest customer; but that, for zinc castings, there is a considerable variation in the weight of castings per car used by the motor manufacturers in different countries. British and American cars each carry an average of between 60 and 70 lb. of die-castings; Franch cars about 30 lb.; German cars 25 lb.; and Italian cars about 20 lb. The other major uses of die-castings in Europe follow a slightly different pattern to that of the American industry, where the second major use is for household equipment; whereas, in Europe, light engineering and electrical goods at present occupy second place.

One result of the steady growth of die-casting in Europe has been the increase in the number of machine manufacturers, whose energetic sales policies have persuaded many firms to instal their own die-casting equipment. There seems to be little doubt that in Europe, trade die-casters are now outnumbered by what in America are called "captive" die-casters, *i.e.*, firms making die-castings mainly for use in their own products, although their output remains smaller than that of the trade die-casters. Some of these firms, who have perhaps only one or two machines and very little experience, constitute a danger to the whole industry, since inferior products can harm the reputation of all die-casters. Nevertheless, the more responsible captive plants are often able, by their experience in other fields, to contribute to the fund of knowledge which is valuable to all die-casters. The British Zinc Alloy Die Casters Association includes in its

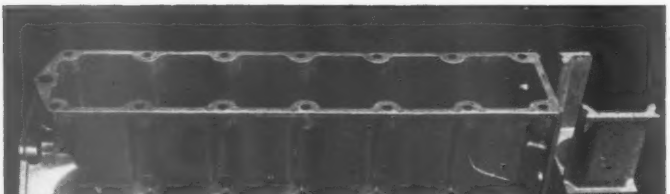


FIG. 1. — *Six-cylinder engine block pressure-die-cast in aluminium alloy and weighing 43 lb. Development of this product is still proceeding particularly with V-8 engines*.*

* An abstract from *Steel* printed in the latest issue of *Austin Technical News* reads as follows: General Motors Corp. (US) have patented a die-cast aluminium V-8 engine block with only very few alloy-steel parts. The patent specification points out that the engine will permit lower body styles. The radiator surge tank is tucked between the cylinder heads, and the crankcase can be 1-in. or less in depth. Some engineers say power to weight ratios will be 4:1 or 5:1 or higher. The block weighs only about 50 lb. and the total engine weight will be about 300 lb.

membership both trade and captive die-casters, who work harmoniously together to improve the process and to increase its applications.

Current Developments

So far, the growth of the European industry has been described in terms of its output, and reference will next be made to some of the technical developments, with a view to encouraging discussion on recent trends in different countries.

In UK, where the production of both zinc and aluminium die-castings is by far the largest in Europe, improved control, works organization and safety have all received particular attention in the last few years. Centralized melting and molten-metal feed to die-casting machines, which have been installed by several British firms, have many advantages. They reduce metal loss and the risk of contamination, enable stricter temperature control, and leave the die-caster free to operate the machine without any distraction. For instituting analytical control, many firms have installed their own spectrographic equipment, three of them having Hilger direct-reading instruments; others have regular control analyses carried out for them by their alloy suppliers.

Methods of handling zinc-alloy ingots (80 per cent. of which now arrive on consumable pallets) and casting, both within the works and for despatch to customers, have also been improved. Many die-casting shops have been re-planned to make handling easier and more belt conveyors and other mechanical aids are now being used. Often in the past, new machines were installed, without proper planning, in crowded unsuitable buildings, but many specially designed die-casting plants have now been built, which make proper provision for expansion and increased levels of productivity. In short, the British industry is today better housed than ever before. Re-organization has been greatly stimulated by the visits to America of the die-casting teams, sent under the auspices of the British Productivity Council and the Organization for European Economic Co-operation.

Problems Being Considered

Although die-casting is a relatively safe industry, it has its safety problems. Recently, in the UK, methods of guarding die-casting machines and of reducing fire-hazards have been studied, and reports have been drawn up on the use of two different fire-resistant hydraulic fluids. All this information will shortly be made available to the European Pressure Die Casting Committee. The British industry it at present actively engaged in the development of new techniques and methods in every sphere of die-casting, and since some of them may produce worthwhile results, brief reference will be made to them as follow: —

(*a*) Die costs are being reduced by the use of standard die parts or by new methods of die-making, such as casting by the Shaw process, and promising results have been obtained with a chromium steel that casts well. Lower die-costs would open up new fields for the industry by making shorter runs economical and making the production of prototype and sample castings possible.

(*b*) The die-casting machine cycle is also coming under closer control and many new machines have been installed that operate automatically, with electronic timers. A control apparatus has been developed in the UK, which takes account of the die temperature in determining the casting cycle, so as to maintain optimum casting conditions.

(*c*) Several types of automatic machines are already in use which are capable of cycling at up to 5,000 shots per hour. So far, the castings being produced commercially are small in size and weight-slide fasteners, watch-cases, purse knobs, small gearwheels and sparking-plug terminals—but larger machines are now being developed.

(*d*) Much has been heard in recent years about the vacuum-die-casting process, and several British firms are working in this field. Its full possibilities are not yet known, although much more is likely to be heard about the process during the next year or so.

(*e*) In a paper to be given later in the Conference, Dr. Edwards will describe research carried out at the British Non-Ferrous Metals Research

Association on the causes of failures in the plating of some zinc castings, and he will also briefly review recent research on anodic finishes for zinc. Crack-free chromium-plating, which would eliminate the need for a nickel undercoating, is also being examined and patent rights are being sought.

Much of this research work is being carried out specially for the Zinc Alloy Die Casters' Association, which is helping to finance it. A few facts about the Association may thus be of interest. It was formed in 1942, and its 48 members—25 trade die-casters and 23 associate or mainly "captive" firms—produce between them over 90 per cent. of the output of zinc die-castings in the United Kingdom. It conducts campaigns to promote the uses of die-castings as well as co-operative work aimed at improving techniques and practices in the industry. A number of publications have been issued and a film is now being made to draw the attention of engineers and designers to the flexibility of the process. Close contacts are maintained with similar organizations in Europe and Australia and with the American Die Casting Institute. Among its other activities, the Association has sponsored a Certification Scheme, which is operated by the British Standards Institution, based on the scheme so successfully pioneered by the American Die Casting Institute. The British Association played a prominent part in the formation of the European Pressure Die Casting Committee.

The Future

What does the future hold for die-casting? The Author suggests that it is full of opportunities. Industrial production in Europe has risen by 50 per cent. since 1950 and, although the rate of increase may be slower in the future, it has been forecast that by 1960 it will have increased by another 20 per cent. The output of motor cars—the industry's biggest customer—has doubled in five years, and should grow even more during the next five. Motor cycles and scooters will become more popular; the manufacture of washing machines, refrigerators, food mixers and other kitchen appliances will increase and the die-casting industry should benefit.

Looking even further ahead, there is the prospect of the European Common Market and the Free Trade Area, with its huge single market of 250 million consumers. Die-casters in Europe will then have opportunities as great as those enjoyed by the American industry to-day. At present, European trade in die-castings themselves is not important, but with economic integration it could increase appreciably. Finished products will move freely within Europe and so longer runs and lower costs should be possible. But to derive the maximum benefit from these new opportunities, die-casters everywhere will have to be ready for them.

The writer has just returned from a short journey in the United States, where he was more than ever impressed by the mature approach of the American industry as a whole to many important aspects of development work and by the way in which standard procedures for dealing with customers were being adopted—a matter on which no doubt other speakers will have something to add. No doubt die-casters in Europe can still learn much from their American friends. Up to the present, most die casters have been able to take pride in the part they have played, as individuals in developing the industry, but now the future expansion of the European industry can, the Author believes, be greatly assisted by closer collaboration between individual firms in their national associations and through the European Pressure Die Casting Committee which was set up in 1953. Its membership now consists of the French, British, German, Italian, Danish, Swedish and Austrian Associations as well as individual firms in Belgium, Holland, Switzerland and Spain. Despite the difficulties in bringing together such different interests and the barriers of language, the Committee has already been able to do much which has been of benefit to die-casters in Europe.

Recent work by the Committee includes the publication of a glossary of die-casting terms in five languages, which has just been distributed, and the English edition of the fifth *European Bulletin* which deals with kitchen appliances. European standards for zinc alloys for die-casting are being prepared and will ultimately be submitted to the International Standards Organization. Information is being exchanged on safety and accident prevention as well as on the uses of die-castings. Since the formation of the Committee, there has been a much more frequent exchange of works visits between European die-casters and many personal friendships have been made which will facilitate future co-operation.

Additional Projects

Training Die-casting Engineers. If the die-casting industry is to expand smoothly, it must recruit and train many young engineers. This might best be done by the establishment of training courses in technical schools, and later on, the European Com-

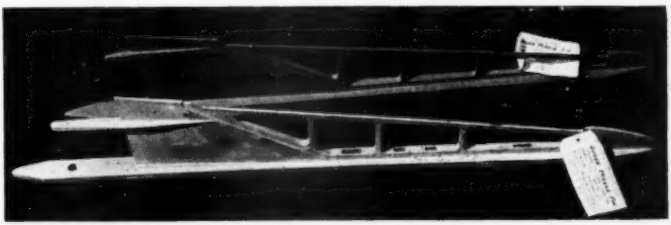


FIG. 2.—*Two examples of guided-missile fins, pressure-die-cast in magnesium-alloy, for Hughes Aircraft (tensile strength 13 tons per sq. in. are subjected to 100 per cent. X-ray inspection).*

mittee might organize the exchange of apprentices and engineers between works in different countries.

New Uses. Although the motor industry will probably continue to be the biggest buyer of die-castings for many years to come, there is a danger in relying too much on one type of customer and the industry must therefore hasten to spread its markets. By exchanging information on new uses through the European Committee, applications developed in one country can rapidly be adopted in another.

End-use Statistics. All watch with interest the growth of the different applications of die-casting in America, which are recorded in the end-use statistics published by the American Die Casting Institute. Similar information collected in Europe would provide a guide to the best lines of development as well as to draw attention to any outstanding uses in one country or another.

Exhibitions. There is perhaps no better way of demonstrating the versatility of the die-casting process, than by exhibitions of die-castings. The comprehensive collection of American castings at the present meeting, arranged by the New Jersey Zinc Company, has set an example which Europe can profitably follow.

Publications. The national associations are all preparing publications aimed at demonstrating the versatility of die-casting, and an exchange of these publications and perhaps their re-issue in other languages is worth consideration.

Design of Die-castings. Many engineers and designers have still to recognize the advantages to be gained by specially designing for die-casting and the way in which it can help to produce attractive designed parts which can be mass-produced. Recommendations made by the European Committee on this subject, with illustrations of selected examples would be of use to all concerned.

Product Standards. The mature outlook of the American industry is reflected in the publication by the American Die Casting Institute of product standards. They set out "run-of-production" tolerances and emphasize the advantages of designing castings for economic production. Fine tolerances can be achieved by die-casting, but they are not always necessary and do not provide a sound basis for the expansion of the European industry, which all confidently expect.

These then are some of the ways in which the European Committee can help in the period of expansion in which die-casters have now embarked. No doubt other founders have ideas on what can be done and since it will perhaps be some years before such another opportunity as the present conference will be available to members for expressing views, it is hoped that all will take advantage of it. The record attendance at the conference is a welcome proof of the increasing interest in die-casting. If all work together to improve the processes and promote the use of die-castings that will ensure that the industry will in future play a more important role in the industrial life of Europe.

The next speaker was Mr. Clifford L. Anthony (of the Hoover Company, Ohio, vice-president of the American Die Casting Institute) who spoke on "The Function of the American Die Casting Institute in an Expanding Die-casting Industry." To complete this session, Mr. J. L. Kimberley (executive vice-president of the American Zinc Institute) was introduced by Mr. Helge Larsen (Denmark) to address the members on "Improved Markets for Zinc Die-casting."

IMPROVED MARKETS FOR ZINC DIE-CASTING

The future of zinc, for die-casting, is assured and the true potential demanded *per capita* favours Europe; nevertheless, the same fundamental limitations, in production requirements, operate on both sides of the Atlantic. Vigorous promotion of die-castings could stimulate the demand for die-casting industrial components—a large potential market. Moreover, the proposed common market and free-trade area should make practical many industrial activities which could not previously be considered. The progressive and efficient die-caster will have opportunities to expand, but he may also have to specialize in the production of specific items. European specifications for die-castings and alloys, which would be essential in such an area, seemed to be well in hand.

US Research on Finishes

During 1955, it became apparent, in the US, that serious threats to zinc-die-casting existed; including

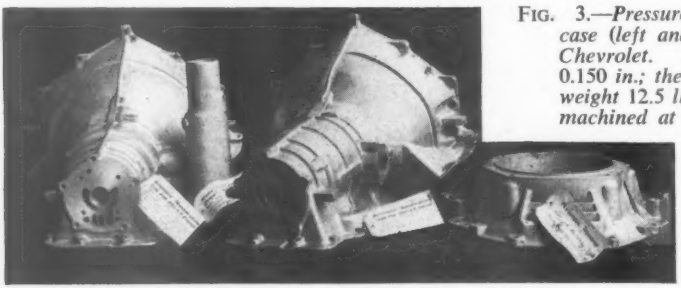


FIG. 3.—*Pressure-die-cast automatic-transmission case (left and centre) for 280-h.p. engine for Chevrolet. The general wall thickness is 0.150 in.; the rough weight 14 lb. and finished weight 12.5 lb. The castings are automatically machined at the rate of 100 pieces per hour; pressure-tightness is an essential. On the right is shown a flywheel housing and second from left, the upper housing for a power steering unit—all pressure-die-castings.*

shortages of nickel; threatened shortages of special high-grade zinc; a vigorous promotion on the part of those interested in aluminium, with anodized finishes in colour which are now available on aluminium sheet products; the threat of the extension of anodized and coloured-aluminium into die-cast products, and the fact that finishing costs on zinc-die-castings were disproportionately high. It is clear that the feared shortage of special high-grade zinc never materialized and did not cause any stoppages. Increased production of "special-high" makes any repetition of that threat unlikely. The nickel situation may be expected to improve significantly, since discoveries of new ore deposits have been made, and there are plans for substantially increased production of the metal. Nevertheless, the zinc producers, through the American Zinc Institute, have undertaken a research programme in order to strengthen the industry's position. The Battelle Memorial Institute of Columbus, Ohio, has been commissioned to explore ways and means for (1) improving existing methods for finishing zinc-die-castings and making them more economical, and (2) to investigate the possibility of coloured finishes on zinc-die-castings which will be both protective and durable.

Progress

One of the first Battelle investigations was aimed at eliminating buffing, electropolishing and bright zinc-plating being substituted. It was felt that this approach may have resulted in economies, particularly for those finishing and plating plants that must buff their die-castngs, by hand, before plating. The importance of a very smooth and bright surface prior to copper, nickel and chromium plating has not been overlooked.

Electropolishing, which should cost no more than conventional electrolytic cleaning, serves to smooth surface irregularities, especially at edges and areas where flash has been trimmed. In addition, electropolishing serves a most important function by rounding off the edges of surface pores, thereby paving the way for success in filling the pores during the zinc-plating operation which follows. It has been established that electropolishing alone is not a satisfactory substitute for buffing, but when it is combined with an electroplating operation, which seals surface porosity and levels surface roughness, smooth mirror-like surfaces can be produced.

Several brightening, and levelling electroplating-procedures and processes have been investigated, with a new procedure for zinc plating possessing the best chance of meeting both technical and economical requirements. Surface irregularities resulting from superficial die-surface roughness and handling scratches are largely eliminated. The ability of the zinc plate to fill surface pores seems outstanding; this, together with the high purity of the zinc plate, may result in improved corrosion resistance for die-castings which are subsequently plated with copper, nickel and chromium by conventional methods. It would appear that the time required for electropolishing and zinc plating is about 30-min., which is about the same time as now required in many plants for buffing and cleaning. However, with suitable equipment, the handling operations before and after buffing may be entirely eliminated for some die-castings. Once the parts are stored in racks, for electropolishing, they can be processed with automatic-plating equipment, through all the plating stages. In cases where flash is completely trimmed, and surface imperfections, such as cold-shuts, are not excessive, the parts can be conveyed directly from the die-casting room to the plating shop, with no intermediate stages for polishing or buffing. Other parts with flash, that cannot be trimmed, will still need to be strapped (ground) or polished at flash areas before they are racked for electropolishing and plating. There may be certain castings with thin sections or large flat surfaces on which a zinc levelling coat would not be adequate to eliminate buffing. In this case, investigations are being carried out to establish whether the original castings might not be cleaned and plated with zinc "as cast," in advance of a simplified polishing and buffing operation. It is anticipated that the zinc plate would flow better, under pressure, than the die-cast zinc-alloy. It is considered that this device probably can eliminate some scrap and reduce the cost of polishing and buffing.

A corollary advantage of this development may be found in the use of zinc-plating solutions, which are promising and which involve acid, rather than cyanide baths, with the result that a costly and sometimes difficult waste disposal operation may be eliminated. Rinse water from the alkaline electropolishing solution can be at least partly neutralized by the rinse water from the acid zinc-plating solution. Unusual chemical or operating condition is not required for either electropolishing or zinc plating. The success of the Battelle work may be attributed to new combinations of chemical formulations and operating conditions. The zinc-plating operation employs periodic current-reversal for improving the levelling power and the brightness of the plate, and an addition agent is required. Although full-bright plate is produced with one set of conditions, levelling power is better with another set, which result in a semi-bright appearance; if necessary this surface can be electropolished for 15 or 30 sec., to produce a mirror finish.

Visual observations of the Battelle staff and the reviewing committee of the American Zinc Institute have been supplemented by photographic and metallographic studies of the surfaces of electropolished and electroplated die-castings. Interferometery with monochromatic light shows that electropolished die-cast surfaces plated with zinc, copper, nickel, and chromium, are equally as smooth as commercially buffed die-cast surfaces plated with copper, nickel, and chromium. Metallographic examinations of representative cross-sections show that the zinc plate almost completely fills surface pores—this is in contrast to copper plate, which appears to have little pore-filling action. The Battelle work has been effected as a small-scale operation in the laboratory; however, the time is approaching when the findings will be tested on a pilot-plant scale.

Pressure Die-casting Conference

Characteristics of the newly developed zinc plate are such, that another application suggests itself and will be investigated—namely, the plating of steel parts with zinc. The electronic and automotive industries specify bright-zinc plate for certain components, which are subsequently given a bleached chromate finish for passivating the zinc surfaces; such steel stampings often have rough surfaces which are not satisfactory in appearance, after conventional bright-zinc plating. The improved process may prove of substantial usefulness, for the coating of steel parts either as indicated or as a base for copper, nickel and chromium.

One of the original objectives of the programme was to explore the possibilities inherent in anodized surfaces; not much work has been carried out, since work by the Non-Ferrous Metals Research Association and others along these lines is known to be in progress. The results of the UK work will be shortly available and further Battelle researches into coloured finishes may well be influenced by the reports of European results.

Hawker Siddeley Group Resolutions

Resolutions increasing the preference dividend from 5 to 5½ per cent., creating 4,000,000 5½ per cent. preference and 6,000,000 ordinary shares, and increasing borrowing powers from £16,000,000 to an amount equal to twice the issued capital and reserves, were passed last week by the Hawker Siddeley Group, Limited.

If the recent offer (which closes on June 7) is accepted 1,660,000 of the new preference shares and 2,672,000 of the new ordinary will be issued to stockholders of the Brush Group, Limited, in exchange for their stock. A further 1,400,000 of the new preference shares will be issued to preference shareholders of the Armstrong Siddeley Development Company, Limited, provided the offer recently made is accepted. This offer also closes on June 7.

New Anglo-French Company

A new company, Climax-France, Limited, a branch of the Climax Rock Drill & Engineering Works, Limited, held its inaugural board meeting at Courbevoie (Seine), near Paris, on May 23. The company, which is a new member of the Holman organization, will be the selling and servicing organization for Maxam equipment, comprising pneumatic valves, cylinders, and connectors increasingly used in the most comprehensive of automatic control systems. Manufacture in France will be in the hands of the St. Chamond-Granat Company, Courbevoie.

In addition to Mr. Jim Holman, sales director of Holman Bros., Limited, and Mr. Baldwin Davies, late director of Climax Rock Drill & Engineering Works, who attended the inaugural meeting, there were three French directors including the Climax Company's former agent, Mr. V. Einstein.

PLANNING PERMISSION has been granted to Mitchell Enginering, Limited, to extend its offices and to build a new canteen at The Bridge, London Road, Peterborough.

Electrical Power Convention

The British Electrical Power Convention is to hold its ninth annual meeting from June 17 to 21 at Eastbourne. The Convention proceedings, which will take place in the Winter Garden, have "Electricity in the National Economy" as their theme; 17 papers are to be delivered on various aspects, and will cover such subjects as generation; transmission and distribution; nuclear energy; industrial utilization of electricity, and houses into homes.

An exhibition, to be held at the same time, will include the following stands of interest to founders: Belling & Company, Limited, Enfield, Middlesex; Courtney Pope (Electrical), Limited, Tottenham, London, N.15; Easiclene Porcelain-Enamel (1938), Limited, Darlaston, South Staffs; English Electric Company, Limited, London; Ferranti, Limited, Hollinwood, Lancashire; General Electric Company, Limited, London; Hoover, Limited, Greenford, Middlesex; Hotpoint Electric Appliance Company, Limited, London; Jackson Electric Stove Company, Limited, London; Metropolitan-Vickers Electrical Company, Limited, Trafford Park, Manchester, 17; Parnall (Yate), Limited, Neasden, London, N.W.10; A. Reyrolle & Company, Limited, Hebburn, Co. Durham; Sangamo Weston, Limited, London, and Sunvic Controls, Limited, London.

Girls in Engineering

The Women's Engineering Society, operating from 26, Victoria Street, London, S.W.1, has organized a week-end conference on "Careers for Girls in Engineering," to be held at the City of Coventry Training College on July 13 and 14. The Society has long been interested in the extension of the opportunities for the technical training of girls and subsequent employment in engineering and scientific posts, and has been further encouraged by the White Paper on technical training recently published. Delegates to the conference will include teachers from girls' public, grammar, and secondary technical schools, representatives of technical colleges and of the Youth Employment Service, training and personnel officers of industrial concerns, and members of the Society. There will be three main sessions dealing with (1) technical education; (2) industrial training and employment and (3) professional achievement, followed by an open forum; there will also be time for informal discussion. The fee for the conference is £3 17s. 6d. for resident, and £2 17s. 6d. for non-resident delegates. Those wishing to attend should apply to the Society at 26, Victoria Street.

Raw Material Prices Rise

Prices of all basic materials used in the manufacturing industry (except fuel) recovered slightly in April after the steady fall during the first three months of the year. The Board of Trade's basic materials index rose to 160 (mid-1949 = 100), compared with 159.1 in March and 154.9 in April, 1956, but it is still 1.6 below the 161.6 peak reached last December.

Copper and zinc were among items which increased in price, but the rise was slightly offset by reductions, particularly a 7.7 per cent. fall in the price of imported steel scrap. There was little or no change in the materials indices for electrical and mechanical engineering and, in general, only small variations in wholesale prices of manufacturing industry. There were rises of less than 1 per cent. in the indices for iron and steel.

British Steel Castings Research Association

Official Opening of New Laboratories in Sheffield

Last Tuesday, the extensive new laboratories of the British Steel Castings Research Association in East Bank Road, Sheffield, was officially declared open by Sir Harry Jephcott, D.SC., F.R.I.C., F.P.S., chairman of the Council for Scientific and Industrial Research. The opening was preceded by luncheon at the Grand Hotel, Sheffield, and afterwards the premises were open for inspection by the assembly and the Press. Members of the Association from South Wales and the Midlands were given the freedom of the laboratories on Wednesday; to-day, those from Scotland and the North East Coast are being received and, tomorrow, the facilities are available to those coming from Lancashire and Yorkshire.

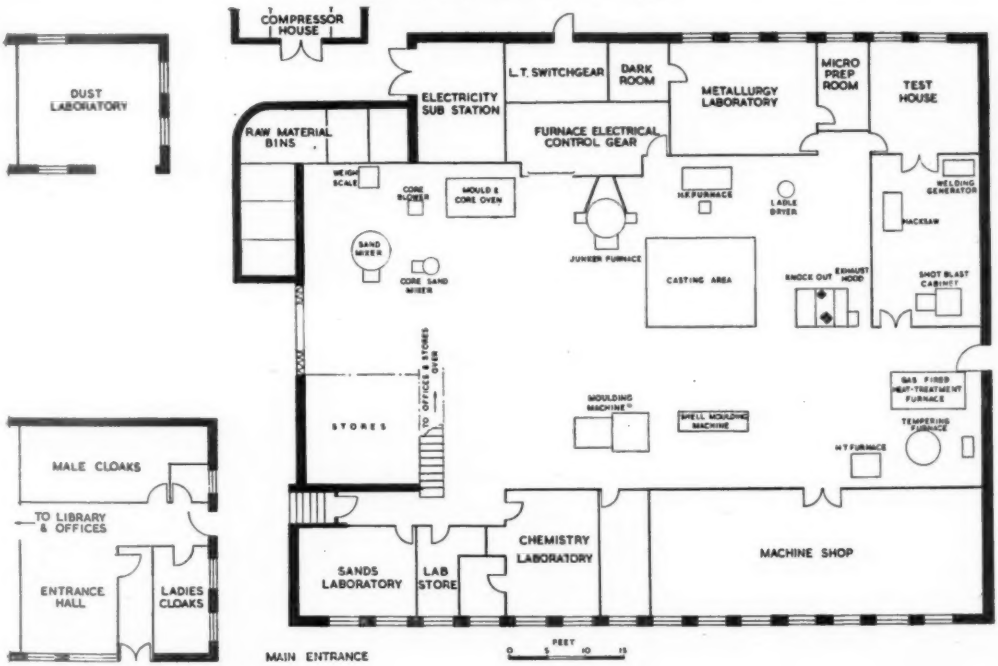
The laboratories, experimental foundry and offices have been built and equipped in twelve months at a cost of £93,000, the whole of which has been accumulated out of revenue. The staff totals 48, of whom 10 are senior-graduate investigators; four bursaries are maintained at Universities. What follows is a description of the new premises as inspected by the JOURNAL representative on Tuesday.

Experimental Foundry

The experimental foundry (Figs. 1 and 2) occupies an area of 90 by 40 ft., most of which is served by a 3-tons-capacity, floor-operated, overhead travelling crane. Provision has been made for all essential foundry operations. Sand-mixing equipment includes a 5-cwt.-capacity batch-type mix/muller for moulding sand and an 80-lb. core- and shell-moulding-sand mixer. Moulding and coremaking are provided for by a jolt/squeeze moulding machine and a coreblower, as well as facilities for hand moulding and coremaking. A gas-fired air-circulating tray-type stove, with temperature controller and recorder, is available for mould and core drying. A shell moulding machine is also installed.

Two melting furnaces, one of 5-cwt. capacity (Fig. 3) and one of 30-lb. capacity (Fig. 4) are available for the production of molten steel. The larger furnace is a graphite-rod resistor furnace suitable for pilot-plant steelmaking research, while the smaller unit is a conventional high-frequency electric furnace for the melting of selected charge material. A high-speed immersion temperature

FIG. 1.—*Plan view of the new foundry and laboratories of the British Steel Castings Research Association at East Bank Road, Sheffield.*



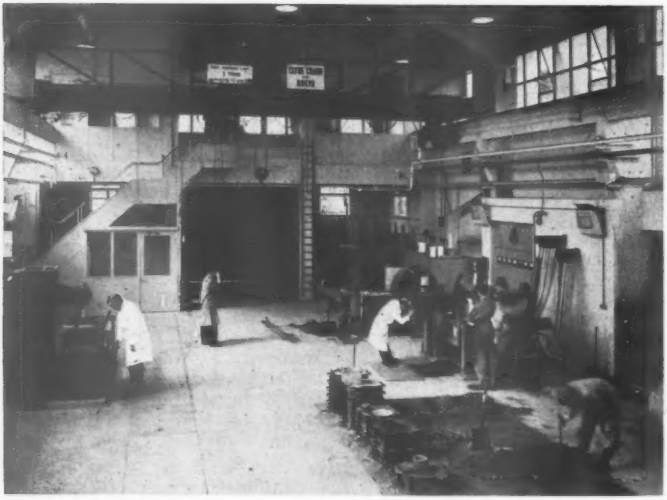


FIG. 2.—*General view of the BSCRA experimental foundry with the moulding floor in the foreground, a moulding machine on the left and melting equipment, top right.*

indicator/recorder pyrometer serves the two furnaces.

A ventilated, stationary, knock-out grid is provided adjacent to the casting area. The fettling area is screened off from the remainder of the foundry floor and is equipped with a heavy power-saw, a shot-blast cabinet, a powder-washing torch and dispenser, an air/carbon-arc torch, a 600-amp. welding generator, gas-welding equipment and the usual range of pneumatic tools.

Heat-treatment facilities which are available comprise a gas-fired recirculating type furnace, capable of a maximum operating temperature of 1,250 deg. C., a smaller electric furnace for use up to 1,000 deg. C., and a vertical, forced-air-circulation tempering furnace. Oil- and water-quenching tanks are also provided. The furnaces are fitted with temperature control and indicating/recording equipment.

Compressed air, three- and single-phase a.c. electricity, gas and water supplies are available at approximately 15-ft. centres on each side-wall of the foundry and a central under-floor duct provides conveniently for temporary service or drainage connections. Space heating is by wall-mounted, individually-controlled gas-fired radiant heating panels.

The foundry roof is insulated and contains four opening ventilators. Good natural lighting is provided by continuous side- and end-wall glazing, with opening lights. Artificial lighting is designed to provide a minimum of 12-ft. candles at the foundry floor level.

FIG. 3.—*A melt being tapped from the 5-cwt. graphite-rod resistor furnace.*

Sand and Chemistry Laboratories

The sand laboratory is well equipped for the routine examination and evaluation of new moulding materials, including sands, mould paints, moulding sand bonds and core-binders that might find application in steel foundries. It also serves as a control laboratory for the experimental foundry and for the development of such special tests as may be required for research projects. Special equipment includes a pH meter (Fig. 5), and a petrological microscope for the mineralogical examination of sands and bonding clays. Equipment for differential thermal analysis of clays and the determination of refractoriness of sands and bonding clays is to be installed.

In addition to being used for routine analysis of steel and slags by normal chemical and absorptiometric methods, the BSCRA chemical laboratory is also equipped for the assessment of silica in samples of foundry-atmosphere dusts by semi-microanalytical methods, the determination of small quantities of alkali metals by means of an Eel

FIG. 4.—*Deoxidizing steel in the 30-lb.-capacity high-frequency melting unit.*

Flame Photometer and the estimation of hydrogen in steel by the Henricot method.

Machine Shop and Test House

The two main functions of the machine shop are the preparation of test-pieces for mechanical testing and macro-examination, and the building of experimental equipment and apparatus; it also serves as a patternshop for the experimental foundry. The main equipment installed comprises two lathes, universal milling machine, a shaper, a surface grinder and a pillar drill.

The test house is equipped to perform any of the mechanical tests which are required in British Standard Specifications for steel castings. A Denison self-indicating "Universal" testing machine of 50 tons maximum capacity is fitted with a load pacer, to enable any required straining rate to be applied when making a tensile test. Accessories to this machine include bend-testing and compression equipment. For the determination of tensile properties in thin sections, such as webs, or for examining variation in tensile properties in a larger casting section, a Hounsfield Tensometer machine is available, which uses miniature test-pieces. An Avery combined Izod/Charpy impact-testing machine provides for the testing of square and round Izod test-bars, and also square Charpy test-bars. In addition, tension/impact tests may be made on this machine. Equipment is available in the test-house for cooling impact test-pieces to sub-zero temperatures, and for the determination of low-temperature impact properties of steel castings. Brinell hardness and Vickers diamond hardness machines are also installed.

Metallurgy Laboratory

The metallurgy laboratory is equipped with two projection microscopes for detailed examination and photography of specimens at high magnifications, a bench microscope for more rapid work, and a low-power binocular microscope for the examination of fractures and similar applications. A separate room is provided for the preparation of specimens for macro- and micro-examination. X-ray diffraction equipment (Fig. 6) is also included in the laboratory for the determination of the constituents of steelfoundry dust, and of the composition of phases present in metallic materials, as well as for the recognition of non-metallic inclusions in steels, and the micro-radiography of thin steel specimens.

An electric muffle furnace with temperature controller and recorder, together with equipment for the accurate calibration of thermocouples are amongst other general equipment. A dilatometer and Jominy end-quench test rig are being constructed. Photographic facilities are provided by a darkroom which adjoins the laboratory (Fig. 8).

Dust Laboratory

The dust laboratory, accommodated in a building separated from the experimental foundry, is devoted to the Association's work in the field of industrial health. For the collection of samples of airborne dust in foundries, various instruments are available such as a thermal precipitator, Owen's jet

FIG. 5.—*Operating a pH meter in the BSCRA sand laboratory.*

FIG. 6.—*X-ray diffraction equipment being used in the metallurgy laboratory, to determine the constituents of foundry dust.*

dust-counter, Konimeter, a Hexhlet sampler, and with apparatus for the assessment of the dust samples collected by them (Fig. 7). A dust tunnel is installed for calibrating and correlating the sampling instruments, for generating synthetic dust clouds, simulating foundry atmospheres and for other experiments relative to the sampling of airborne dusts. Provision is made also for the temporary installation of equipment required for pilot-scale experimentation on problems associated with dust suppression. Apparatus of the type described by Stairmand for determining the efficiency of dust collcetors is under construction.

Services

The value of cine photography as a means of recording experimental techniques and results, and of demonstrating those results to members has been recognized. The Association is equipped with 16 mm. cine camera, lighting equipment, and animation bench and film editing facilities (Fig. 8). Several sound and silent films in colour and monochrome have already been produced by the staff.

To assist the Association's staff and member firms to keep in touch with technical developments, the information section watches the relevant literature of all industrial countries. Publications in many languages are summarized in *BSCRA Abstracts*. A library is maintained which aims at complete world coverage in the special field of steel castings.

The degree of flexibility required by research laboratories in the provision of services has been met economically by surface distribution of three- and single-phase electricity, cold water, compressed air and town's gas throughout the laboratory buildings. Drainage is also provided in each laboratory. Special care has been taken to ensure that modifications and additions can be made with the minimum interference to existing supplies. Space heating in all the small laboratories and in the administration building is by thermal storage electric heaters.

Organization

The British Steel Castings Research Association was incorporated on March 5, 1953, and commenced to receive financial support from the Department of Scientific & Industrial Research in April, 1954. It is the successor of the Research and Development Division of the British Steel Founders' Association which was established in 1950.

The membership totals 58 members and 4 associate members, some 80 per cent. of the UK steel founding industry being represented. Membership has increased by 33 per cent. in the last two years, and industrial income by 100 per cent. since 1953. Liaison with member-firms is accorded the highest possible priority, up to 90 per cent. of those in the UK being visited by the staff each year. Ninety per cent. of the membership in the UK attend the annual conference and no less than half the membership is represented on five technical advisory committees, attendance at meetings of which averages 85 per cent. The present buildings have a total floor area of approximately 12,000 sq. ft. and occupy approximately half of the available site area. Provision has been made for adding a further floor to the administration building, to provide additional accommodation for the research staff and laboratories.

FIG. 7.—*Assessment of atmospheric dust samples, collected by various instruments, in the dust laboratory.*

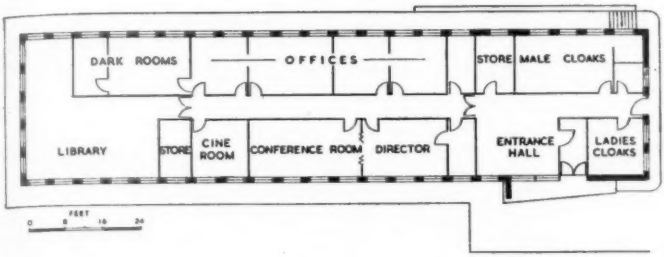


FIG. 8.—*Plan view of the administration block of the BSCRA new laboratories at Sheffield, showing the situation of library, dark room, cine room, and general offices.*

The Council of the Association comprises the chairman: Mr. C. H. Kain; Mr. A. H. Catton, Mr. J. Currie, Dr. C. J. Dadswell, Dr. E. Gregory, Dr. R. Hunter, Mr. J. Jackson, Brigadier A. Levesley, O.B.E., Mr. A. B. Lloyd, Mr. F. N. Lloyd, Mr. G. M. Menzies, Mr. R. J. Richardson, Mr. F. W. Rowe, Mr. W. Scott, O.B.E., Mr. W. S. Scott, and Dr. M. A. Vernon. The Association's director is Dr. A. H. Sully and the secretary, Mr. John Bolton. The heads of research sections are as follow: *Foundry Processes:* Mr. J. M. Middleton; *Metallurgy:* Mr. W. J. Jackson; *Plant Engineering:* Mr. C. M. Stoch, and *Steelmaking:* Mr. T. A. Cosh.

Demonstrations and Exhibits

Demonstrations and special exhibitions have been arranged for the "Open Days" on the following subjects: Dust sampling; assessment of dust samples; noise abatement; air-supplied respirator; magnetic properties of steel castings; X-ray crystallography; thermocouple calibration; low temperature impact testing; tensometer testing; sodium-silicate bonded shell moulds; examination of core binders; probe assessment of mould drying; oxygen injection; air carbon arc torch; magnetic particle inspection; sand reclamation; properties of moulding sands; high-temperature properties of moulding sands; CO_2 Process; sand compaction by moulding machine; the flame photometer; determination of hydrogen in steel; the stearin wax/steel analogy; soda ash treatment of used foundry sands; bonding clays; absorptiometric (Spekker) analysis (working demonstration); determination of fluorine in slags, and examples of enquiries received from members and the information service provided.

Publications Received

Aluminium in Electrical Engineering. Issued by the Aluminium Development Association, 33, Grosvenor Street, London, W.1. Price 4s. 6d.

This publication is an introductory survey designed to show the range of existing applications of aluminium and its alloys and their potentialities in the electrical-engineering field. Certain technical aspects are discussed briefly, in particular the rapid and successful development of jointing techniques. A brief statement of the case for applying aluminium, covering economic and technical factors, is followed by summaries of relevant British Standards and of the electrical, mechanical, chemical and fabricating properties of aluminium materials for electrical uses. The survey of applications, which forms the major portion of this brochure, is grouped under four main headings: conductors and cables; telecommunications; stationary plant, and rotating machinery. An appendix tabulates the properties of materials used in electrical-engineering applications (a) for conductors and sheathing and (b) for constructional purposes. (The booklet has special significance related to the symposium organized on the same subject by the Aluminium Development Association in London this year—see JOURNAL, May 23.)

Technical Data for Magnuminium and Magnesium-, Zirconium- and Thorium-containing Alloys. Issued by High Duty Alloys, Limited, Slough, Bucks.

This booklet is issued to assist designers to select the most suitable Magnuminium alloy (basically aluminium/manganese) for particular requirements. The nominal composition, physical and mechanical properties of the alloys manufactured by the company are given. Reference to these data sheets should enable an appropriate alloy to be chosen, but, if required, more detailed information is available from the company. Technical data is also included on the zirconium-thorium containing cast and wrought alloys which are also manufactured, under licence, by High Duty Alloys, Limited. No fewer than eleven casting alloys are listed, including Nos. 127, 181, 191 and 220 in the Magnuminium series, and four engine alloys ZRE1, ZRE0, MCZ and ZT1, notable for high creep resistance.

European Zinc-alloy Die-casting Bulletin, No. 4. Issued by the Zinc Development Association, 34, Berkeley Square, London, W.1.

This issue deals with the field of light engineering, and discusses the scope for zinc-alloy die-castings in this sphere, together with their high dimensional stability. The first page shows gears and pinions, and other pages feature small tools and parts for textile and sewing machines, weighing and slot machines. Examples and illustrations are given showing the uses and qualities of die-casting components. Copies of this bulletin can be obtained, free of charge, by writing to the address quoted.

Brief Subject and Author Index of Papers in the Proceedings, 1937-1955. Published by the Institution of Mechanical Engineers, 1, Birdcage Walk, Westminster, London, S.W.1.

When the Institution of Mechanical Engineers was very young, there were quite a number of papers on foundry practice, then there was a long void. Since 1937, however, there have been about a dozen excellent papers on the subject and these are included in this present index. The Institution provides a very useful service to technology by the periodic printing of these indices.

Company News

BERTRAMS, LIMITED, engineers and ironfounders, of Edinburgh—The company proposes to make a one-for-one scrip issue, involving 165,000 £1 ordinary shares, for which Treasury consent has been received.

MONSANTO CHEMICALS, LIMITED—The committee of the Cardiff Stock Exchange has granted permission to deal in and quotation for 5,400,000 ordinary shares of 5s. each in the company, subject to the issue of letters of allotment.

THOMAS LOCKER & COMPANY, LIMITED, woven wire manufacturers and general engineers, of Warrington (Lancs)—The company is effectively raising its total dividend by 2½ per cent. for the year to March 31, 1957. A final of 10 per cent. makes 20 per cent. on the £500,000 capital; a similar total for 1955-56 included a 10 per cent. interim prior to a one-for-three scrip issue. Group profits after tax and depreciation were £148,351 (£120,209).

ALLEN WEST & COMPANY, LIMITED—Group trading profit for the year to January 31, 1957, expanded by £190,949 to £1,285,245. This was largely due to the No. 4 factory going into production. The Rhodesian subsidiary, which commenced operations in February, 1956, was successful in making a profit in its first year. The net profit attributable to the holding company is £499,401 (£454,741); the dividend is 15 per cent. (same), and a three-for-10 scrip issue is proposed.

NORTH CENTRAL WAGON & FINANCE COMPANY, LIMITED—As a result of hire purchase and credit sale restrictions, new business accepted by the company in 1956 declined by 29 per cent. in value. The net profit expanded from £346,863 to £396,131. The dividend on the £1 shares (10s. paid) is 1s. 6d. per share (1s. per 5s. paid-up share), also a capital distribution of 7½d. per share (same). In addition it is proposed to eliminate the uncalled 10s. per share liability by capitalizing £789,500.

ELLIOTT BROS. (LONDON), LIMITED, electrical and electronic instrument manufacturers—A licensing agreement has recently been made with the Swartwout Company, of Cleveland, Ohio, for the manufacture of electronic controllers for automated process plants; production facilities are being expanded for digital electronic computers; and the nucleonics division is engaged on contracts for instrumentation of nuclear power stations. The profit of the parent company is £292,818 (£260,685) and that of Associated Insulation Products, Limited (acquired last November), £272,798. The year's ordinary dividend is 20 per cent., of which the 10 per cent. interim was on a smaller capital.

Recent Wills

WATSON, W. S., of Beckingham (Notts), shipbuilder £47,257

SHARDLOW, F. C., of North Wingfield (Derbyshire), master welder £7,156

WESTWOOD, JAMES, chain manufacturer, of Joseph Westwood (Cradley Heath), Limited £44,874

STATON, ROWLAND, a director of Firth-Vickers Stainless Steels, Limited, Sheffield, and of Shepcote Lane Rolling Mills, Limited £13,453

HOARE, E. S., of Esher (Surrey), former senior partner of Hoare, Lea & Partners, consulting engineers, of Edgbaston, Birmingham £81,232

KEAY, E. D., chairman of E. C. & J. Keay, Limited, constructional engineers, of Birmingham, and Iron & General Investments, Limited £67,664

JAMES, JOSEPH, of Sunderland, formerly plant engineer at the Sunderland South Docks Works of the North Eastern Marine Engineering Company, Limited £5,283

ELLIOTT, J. W., chairman of Swan, Hunter, & Wigham Richardson, Limited, the Wallsend Slipway & Engineering Company, Limited, Titan Crane, Limited, Glasgow Iron & Steel Company, Limited, and other companies, former president of the Shipbuilding Conference £57,830

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.)

772,790. British Oxygen Company, Limited, Bridgewater House, Cleveland Row, London, S.W.1.

Improvements in gas-shielded electric-arc welding. An air gap is sometimes caused between the gas shroud and the surface of the work, caused by hot air rising from the work-piece. In this patent, a means is claimed whereby this gap may be obviated by increased velocity of the shielding gas, whilst maintaining the conditions of gas flow and minimum turbulence necessary according to the nature of the weld.

772,805. Lukens Steel Company, Coatesville, Chester, Pennsylvania, USA.

Composite metal products comprising a metal base layer, a cladding layer of zirconium or its alloy and an intermediate barrier layer. This intermediate layer is an iron/chromium alloy in contact with the cladding layer, for bonding the base and cladding layers together.

772,842. Gutenoffnungshutte Stekrade, A.G., Oberhausen, Rheinland, Germany.

An apparatus for treating liquid iron for the production of spheroidal graphite. A reagent consisting of pure manganese or an alloy thereof (having at least a 40 per cent. manganese content) is introduced in the liquid state to the molten metal, through an inlet nozzle formed as a separate interchangeable body. (See also Patent No. 746,594, FOUNDRY TRADE JOURNAL, May 24, 1956.) The nozzle is preferably made of a sintered, pressed and highly-heat-resistant substance, and reinforced by inner metal wires or bands, and surrounded by a casing.

House Organs

The Modern Foundry, No. 1, 1957; issued quarterly on behalf of Gibson Engineering (Sales) Pty., Limited, 466-470, Wilson Street, Redfern, Sydney, Australia.

This issue contains an account of a new type of sand hopper which apparently has a positive and automatic feed, but it is not too easy to follow from the description just how it works. A second article covers the dry mixing of resin with sand—an interesting topic.

Sif-Tips, Vol. 23, No. 97; issued by Suffolk Iron Foundry (1920), Limited, Stowmarket, Suffolk.

"SIF at 134 m.p.h." is one of the articles in this booklet; it describes the chassis of the Lotus racing car in the construction of which the company's welding materials were used. An account of the fabrication of a 13-ton container wagon for the British Suger Refining Companies, and a well-illustrated article on weld repair of iron castings are also included.

Close-up; issued by Armstrong Whitworth (Metal Industries), Limited, and Jarrow Metal Industries, Limited, Close Works, Gateshead, 8, Co. Durham.

This issue reports the retirement, after 29 years as foreman in the fettling bays of both works, of Mr. H. Herdman. (A paper by Mr. Herdman, "Treatment of Castings after Casting" was published in the FOUNDRY TRADE JOURNAL some years ago.) Also in this issue is an article by W. E. J. Adams on "General Engineering," which describes the birth of the engineering department of the company and its progress up to the present day.

National and Midland Ironfounders' Association

Report of Business carried through since September, 1956

The annual general meeting of the National and Midland Ironfounders' Association, which was held at the Grand Hotel, Birmingham, on May 23, was attended by 122 members. Mr. J. W. Gardom presided, and after the revised constitution and the accounts had been adopted and approved he delivered his report, in the course of which he said:—

He was pleased to be able to draw attention to the fact that the executive had been able to bring forward the meeting to a date nearer that of the accounting year and he had no doubt further progress in this direction would be made in future. The report, therefore, covered a period from last September and was of necessity brief.

Council of Ironfoundry Associations

Undoubtedly the most important event to report was that the Association was admitted to the Council of Ironfoundry Associations on October 18, 1956, on which body the Association now had two representatives, Mr. E. C. Marsland and Mr. W. James, with Mr. P. Rice as deputy. From the officers of the Council, much help and encouragement was invariably received, and NMIA were fully determined to pursue a constructive and co-operative policy with that body. The executive had already taken up questions of the quality of coke, the Clean Air Bill, shortage on rail deliveries and adverse publicity.

Restrictive Trade Practices

The effect of this Act had involved the executive committee in much discussion. As members were fully aware, any reference to price recommendations was registrable under the Act and the committee had decided to avoid this procedure until such time as the general meeting decided otherwise. This matter was on the agenda for further discussion. Many of the smaller members were not satisfied with the proposal that cost information only should be circulated.

Foundry Regulations

The far-reaching effects of the Foundry Regulations were now being felt in all sections of the Association, but it was only too pleased to give what help it could with members' difficulties under the Act. He could not stress too strongly, the need in some instances to conform more closely to the statutory requirements and to urge that the example of the better firms should be emulated. It was to the advantage of the industry so to take care of matters relating to housekeeping and other working conditions, that good foundry labour of all types was attracted into the industry.

In July a most constructive open meeting was held at Wolverhampton, at which Sir George Barnett was the chief speaker. The Association was indebted to Sir George for his interesting and informative address and to other members of the panel for their contributions.

Clean Air Act

The necessity of placing the supervision of this Act, insofar as ironfounders were concerned, in technical hands was appreciated by both this Association and the Council of Ironfoundry Associations. The Association were supporting the efforts being made by that body for the ironfounding processes to be taken under the wing of the Central Inspectorate.

Legal Advice

It was the policy of the committee to extend the activities of the Association in those fields which were of interest to the practical foundrymen. On the recommendation of the sub-committee under the chairmanship of Mr. Marsland, and with the approval of the executive, the Association had made arrangements with Mr. W. Gough, of Blewitt & Company, to provide legal advice on day-to-day foundry matters. This scheme had already achieved some success. Where matters were of such a major nature or if litigation was involved, the expense was borne by the member-firm, otherwise the Association was responsible.

Wages

Members were fully aware of the effect of the recent arbitration award increasing founders' wages by anything from 4s. per week up to (in some cases) 1s. 1d. in £ on piece-work earnings. The implications of this award were very serious for members and made it very difficult for them to maintain a stable level of costs. The wages claim at present subject to a dispute with the engineering unions would also affect "engineering foundries." The Association had taken a most serious view of this increase and had expressed, on behalf of members, its apprehension of the position to the Engineering and Allied Employers' Association.

He would, however, like to stress that the Association was not responsible in any way for wages and working conditions and that any information received was obtained by the courtesy of the Employers' Association. If members wished to receive more comprehensive details and to have a greater say in these important matters, they should become members of the Engineering and Allied Employers' Association.

National and Midland Ironfounders' Association

General

Finally, he thanked all members of the executive for their work during the year and for the enthusiasm and interest they took in the Association's affairs, and urged all members to do what they could to encourage other firms to join this progressive Association, because it was only by a large and representative membership that its views could command the attention that they richly deserved.

After Mr. Gardom had been thanked for his report, a vote showed that a substantial majority was in favour of registration under the Restrictive Trade Practices Act. Mr. W. James, Monmer Foundry, Limited, Willenhall, and Mr. E. C. Marsland, Repton Foundry, Limited, Tividale, were appointed to represent the Association on the CFA.

Officers for 1957/58

Mr. J. W. Gardom is president; Mr. W. H. Thursfield, J.P., Izons & Company, Limited, West Bromwich, chairman; Mr. W. James, deputy chairman, and Mr. W. H. Thursfield and Mr. W. James, trustees. The following were elected as members of the executive: Mr. H. Hanks (Alfred Ellison, Limited, West Bromwich); Mr. E. C. Marsland; Mr. P. Rice (Edward Matthews, Limited, Bilston); Mr. W. Spear (John Harper & Company, Limited, Willenhall), and Mr. F. G. Timmins (George Clancy, Limited, Halesowen). Mr. L. H. Cleaver, J.P., F.C.A., was reappointed secretary.

Platt Bros. Reorganization

It is announced by Platt Bros. & Company (Holdings), Limited, textile machinery manufacturers, of Oldham (Lancs), that reorganization of the group's capital structure is in an advanced state and it is intended to make an offer to acquire the shares not already held in the three subsidiary textile machinery manufacturing companies.

The offers are as follow:—For every two ordinary £1 units in Textile Machinery Makers, Limited, one ordinary £1 share and debenture stock; for every five ordinary or "A" ordinary 10s. shares in Tweedales & Smalley (1920), Limited, one ordinary £1 share and debenture stock; for each ordinary or "A" ordinary £1 share in the private company, Prince-Smith & Stells, Limited, one £1 ordinary share and debenture stock.

The existing 4½ per cent. first preference and 7 per cent. (cumulative as to 5 per cent.) second preference of Platt Bros. will be consolidated into one class of 5½ per cent. preference ranking with the preference to be issued for preferences in Textile Machinery Makers. Terms will be announced later.

BRITISH THOMSON-HOUSTON COMPANY (CANADA), LIMITED—Mr. H. G. McHaffie has been appointed managing director.

AIRSCREW COMPANY & JICWOOD, LIMITED—Sir Anthony Elkins and Mr. P. F. S. Warren have been appointed directors.

Employers and Technical Education

Criticism of certain employers who still seemed to hold strong views against national educational schemes for their employees, and particularly against the provisions which relate to part-time attendance at technical colleges, was made by Sir Edward Boyle, Parliamentary Secretary to the Ministry of Education, when he spoke to Nottingham Chamber of Commerce recently. It was the attitude of employers towards releasing their employees for educational purposes which determined the rate of advance in industry.

Stressing the importance of the role which employers must play in the expansion of technical education, Sir Edward urged them to get to know their technical colleges, and to meet the principals and governing bodies. He also urged them to support day-release schemes, not merely by giving their employees a day a week at a technical college, but also by taking an interest in their progress. He asked that they might have a look at the needs of their organizations to see whether it would be a good thing to arrange sandwich schemes for the highly trained staff.

"It is the countries which have the best educated and best trained population which are going to win the race for world markets," said Sir Edward. "We can win the race for ourselves, but only if our employers are farsighted enough to take advantage of the facilities which we are building up."

Film Review

NEW LIGHT ON INDUSTRY

The provision of an adequate system of lighting in works—including foundries—is a matter which does not always receive the considered attention that it should. Modern precision manufacturing methods and high standards of inspection have made it necessary that adequate lighting, both in regard to intensity and quality, is available if production rates are to be maintained at a maximum and rejects at a minimum.

Such is the theme of a new film entitled "New Light on Industry" introduced recently by the British Electrical Development Association. The film describes the experiences of an industrialist who, when planning a new factory, sets out to see for himself what can be achieved by implementing modern knowledge of lighting in the works and in the office. It shows a number of examples of good industrial lighting practice and illustrates how modern lighting methods can be introduced into existing factories and buildings. The desirability is emphasized of planning a lighting system at the drawing-board stage, before work is started on the construction of a new factory.

The running time of the film is 31 minutes and copies are available or may be purchased from the Electrical Development Association, 2, Savoy Hill, London, W.C.2.

SEVEN BRITISH shipbuilding and industrial concerns now hold manufacturing licences for the Pescara free piston engine system. They are:—Charles D. Holmes & Company, Limited; Smith's Dock Company, Limited; Free Piston Engine Company, Limited; Alexander Stephen & Sons, Limited; General Motors Corporation, Limited; National Gas & Oil Engine Company, Limited, and Lithgow Power Development Company, Limited. The exclusive licensor for the system in the British Commonwealth is Alan Muntz & Company, Limited.

Clean Air Act

Ironfounding Industry's Case for Special Treatment

The public inquiry ordered by the Minister of Housing and Local Government, to hear applications by a number of industries for treatment as special cases under the Clean Air Act, opened in London on May 27. At the inquiry, the director of the Joint Iron Council (Mr. Kenneth Marshall) presented the case for the ironfounding industry and examined a number of "witnesses" on May 28. The inquiry is being conducted by Sir Frederick Armer, K.B.E., a deputy secretary of the Ministry of Health until his retirement in 1956, assisted by Mr. W. A. Damon, C.B.E., as assessor, Mr. Damon was the Chief Alkali Inspector in England and Wales at the time of the Beaver Committee's Report, and has subsequently been adviser to the Minister on matters relating to air pollution.

Reasons for the Application

Ironfounders, generally, are aware of the basis upon which rests the industry's plea for scheduling as a special case, and the course of action suggested by the Council of Ironfoundry Associations to deal with the matter has met with general support from the industry. The ironmaking processes used by the members of the Council of Iron Producers presented similar air pollution problems, though on a larger scale, to those of the ironfounders and in the circumstances, it was found convenient for the case for both sections of the iron industry to be presented by the Joint Iron Council, although the detailed technical evidence covering blast-furnace processes was, with the agreement and support of the Joint Iron Council, presented by the British Iron and Steel Federation.

It should be emphasized that both ironfounders and iron producers are anxious to play their part in ensuring that the Clean Air Act operates effectively in the public interest, provided that the technical difficulties involved are fully appreciated.

Technical Panel

The case presented by the Joint Iron Council was based upon a long and thorough examination by an expert panel, with full assistance from the British Cast Iron Research Association, represented on the panel by the director, Dr. J. G. Pearce, O.B.E. Over a period of months the panel has worked unremittingly, having regard to paragraph 100 of the Report of the Committee on Air Pollution (Cmd. 9322), which suggests that the list of scheduled processes should include: "Metallurgical works as defined in Section 109(1) of the Public Health Act, 1936, in so far as they present special difficulties in regard to the prevention of air pollution."

The Joint Iron Council formally applied for the following processes to be added to the list of works in the First Schedule of the Alkali, etc. Works Regulation Act, 1906:

1. Processes in the production of pig-iron for foundry use, in which iron ores or residues and other materials are handled, prepared, agglomerated and melted.
2. Processes for the melting and treatment (*i.e.*, in the molten state) of iron and steel in the production of iron castings and of refined pig-iron.
3. Processes for malleablizing of iron castings where the furnaces are fired by pulverized fuel or solid fuel.

Presentation of the Case

At the inquiry, the director very fully outlined, with many visual aids, the extent and nature of the iron industry, and its national significance as a basic industry of vital importance to almost every other industry in the country.

He stated the following technical difficulties in regard to the prevention of air pollution in processes (2) and (3) set out above: (*a*) The present state of knowledge in this country (and elsewhere) is such that the complete nature of the emissions from such furnaces is not known; (*b*) full success in trapping or collecting these emissions must await the completion of experimental research; (*c*) at the present time, ways and means for the complete elimination of these emissions are unknown; (*d*) major elimination of these emissions could only be provided at a completely prohibitive cost and (*e*) standards of acceptable emissions do not exist.

The director then presented the special case for ironfounding and called "expert" witnesses to testify as to various phases of dust- and fume-producing operations. Amongst those so called were the director of the BCIRA, Dr. J. G. Pearce, Mr. F. M. Shaw (also of BCIRA); Mr. G. E. Lunt, (works director, Bradley & Foster Limited); Mr. W. Brindley (chief executive director, Dartmouth Auto Castings, Limited); Mr. M. M. Hallett, F.I.M., managing director Chamberlin & Hill, Limited; Mr. D. Phimister (director, Thomas Perry, Limited, and Midland Rollmakers, Limited); Mr. H. G. Hall (director, Castings, Limited); Dr. H. T. Angus (development manager, BCIRA) and Mr. A. E. Peace (technical director, Ley's Malleable Castings, Limited). In this manner, specific points relating to various phases of ironfounding practice were brought out, including the special investigations of the BCIRA Foundry Atmospheres Committee, the manufacture of refined iron; the problems of hot-blast cupolas, spark arresters, air and rotary furnaces; smoke emissions, and the malleablizing process.

Summing Up

Summing up the ironfounding industry's case, Mr. Marshall reviewed the progress made in the industry since the war in the study of and approach to solutions of the kind of problem the inquiry was investigating. He referred to the attempts made to increase knowledge of foundry processes as a

Clean Air Act

preparation for more efficient control, and to the facilities that existed in the BCIRA. He thought the case presented would make it clear that the industry was not closing its eyes to the problem of implementing the Clean Air Act. The collaboration which it showed in the preparation of the original "Garrett Report," was quoted as an example. When the Ministry of Labour had decided to bring out Regulations for iron and steel foundries, the industry had co-operated in giving full technical consultation in framing them, and to providing an advisory service to facilitate their speedy implementation. It was perhaps as well to recall that all research into clean-air problems had taken place since the war. While the industry realized and accepted the full implications of the Clean Air Act, they had also to take into account the responsibility for continuing to meet the economic demands of the country's manufacturing and trading position. They were ready to throw their resources into the fight for clean air, with confidence that they would have the support of the Government in the appropriate field. But in this field, where there were so many uncertainties, where there was so much that needed to be known, and where the industry was ready to throw its resources into the struggle, that interest would be better served through one central point of contact—as would be secured by including ironmaking and founding under the schedule of the Alkali, etc., Works Regulation Act—than by running the risk of dispersing limited forces over a wider field.

"It can be argued," continued Mr. Marshall, "that some of the smaller foundries, melting intermittently, perhaps, and in areas where they are not constituting at the present time an active nuisance, might not be a priority in this particular setting which was being considered. If that were accepted, then it might be possible to concentrate attention in those directions where results would be more speedily gained, and meanwhile the resources of the British Cast Iron Research Association's Advisory Service are fully available."

Then there were the more obstinate cases—obstinate in the technical sense. In those cases it would clearly be desirable that there should be the fullest co-operation between technical authorities in the industry and in the Ministry. Melting processes fell into the same category as other processes which had been the subject of earlier representations. They all dealt with hot metal and, with the single exception of the case argued by Mr. Peace on the subject of malleablizing, all founders contentions fell into this category.

The precise wording of the submissions was capable of some variation and, if it were thought convenient—by further consultation, either to widen or to narrow the boundaries, the industry would be glad to give the fullest help.

Need for Research and Consultation

The final point he wished to make was the absence at the present time of any real standard of acceptance. That was one of the difficulties with which they were faced. It was partly due to the fact that more information and research were needed. But the definition in the Act of "practicable," though complete in itself and an excellent attempt to define the almost undefinable, brought a practical problem for anyone seeking to interpret it in particular cases. There was a delicate balancing of conflicting considerations and he felt that it should not be left always to judicial interpretation. In those circumstances, and pending agreed standards over a wide area, it would seem that there would be considerable danger in undue weight being given to one consideration more than another. Reference was made, as well known to local conditions and to financial considerations, and so on, and those might be difficult to standardize; nevertheless the attempt should be made in consultation with the industry concerned to arrive at acceptable standards as a first step. Founders might be alone in that as an industry, but that was the way in which they looked at it. If that could be done, it would seem that at any rate some interval of time should be allowed for collaboration between the central inspectorate and the industry to see whether it was in fact possible to reach agreed technical standards. If, subsequently, in the iron industry's case it was decided that those standards could be arrived at, then, in the industry's view, would be the time to consider whether the whole problem was capable of being handled by a diversity of authorities.

It should be noted that some time is expected to elapse before the findings of the public inquiry are made known.

Notes from the Branches

Wales and Monmouth

The Wales & Monmouth branch of the Institute of British Foundrymen held their annual dinner/dance at the Royal Hotel, Cardiff, on Friday, April 26, when the chief guest of the evening was the national president, Mr. H. J. V. Williams; also present were the senior vice-president, Mr. J. Blakiston and Mr. D. A. Richards, past-president of the Bristol branch, all of whom were accompanied by their ladies.

Following the loyal toast, Mr. Gordon Rees, branch president, expressed on behalf of all members the pleasure of greeting one of their own branch members as national president of the Institute. He realized that the position demanded a very high standard of service, and he was sure that Mr. Williams had spared no effort to attain such a standard.

Replying, Mr. Williams thanked Mr. Rees for his remarks, and said he was very pleased to see so many members and their ladies present. They were there to enjoy themselves, but he could not pass the occasion without a reference to the work of the Institute, the importance of which to the industry was recognized throughout the world. Membership was steadily increasing and there was every reason to be proud of progress and attainments. Following the dinner, members and guests danced until 1.0 a.m., during which session Mr. Duddridge acted as M.C. with signal success.

"Isn't everything a shocking price Mrs. F!".....

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News in Brief

THE ROYAL COUNTIES Agricultural Society and Hackney Horse Society are holding their "Great Show" from June 19 to 22 at Guildford.

AVERAGE SELLING PRICES (calculated to the nearest 10s.) for the month of April of members of the Federation of Light Metal Smelters were:—LM1, £166 per ton; LM2, £162; LM4, £185 10s.; LM6, £204 10s.

THE NEW APPRENTICES at Western Foundries, Southall, Middlesex, are indeed fortunate, as they are to have a holiday in Milan, in September, as the guests of the directors. During their visit, they hope to see something of the Italian foundry industry.

THE BRITISH STANDARDS INSTITUTION announces that parts 2 and 3 of B.S.1016:1957 Methods for the analysis and testing of coal and coke, have now been published. Part 2 deals with the total moisture of coke, and Part 3 proximate analysis of coal. The former costs 2s. 6d. and the latter 5s.; both are obtainable from the Institution at 2, Park Street, London, W.1.

A LICENCE AGREEMENT has been concluded between Armstrong Siddeley Motors, Limited, Coventry, and the Garrett Corporation, of Los Angeles, United States, which covers the manufacturing and selling rights in Britain of the auxiliary power gas turbines and air turbine starters developed by the AiResearch manufacturing divisions of the Garrett Corporation. The licence will be ratified with the approval of the respective governments.

G. & J. WEIR, LIMITED, the Glasgow engineers and founders, has acquired a controlling interest in Peacock Bros., Limited, manufacturers' representatives and engineers, of Ville La Salle, PQ, Canada, which has been established for over 60 years, during much of which period it has represented G. & J. Weir and Drysdale & Company, Limited (of which G. & J. Weir is the parent company), Glasgow, as well as other British and American firms.

LONG SERVICE AWARDS were presented to 30 employees of the British Tyre & Rubber Company, Limited, group of companies at a ceremony held at St. Ermin's Hotel, London, S.W.1, on May 22. The awards were presented by the chairman of the company, Sir Graham Hayman. Among the recipients were three employees each with over 50 years' service, and other awards were for 40, 30 and 20 years. Mr. P. W. Howard, the managing director, was among those who received an award.

The DUCHESS OF KENT visited the Hadley Castle works of Joseph Sankey & Sons, Limited, on May 29. She was accompanied by Mr. Geoffrey Sankey, director and general manager. Mr. K. S. Peacock, chairman of Guest Keen & Nettlefolds, of which Sankeys is a subsidiary, presented her with a gold brooch, inset with diamonds and sapphires, which was in the form of a replica of the first wheel made by Sankeys in 1909. In the tool shop the Duchess was presented with a brass cigarette lighter made by apprentices of the firm.

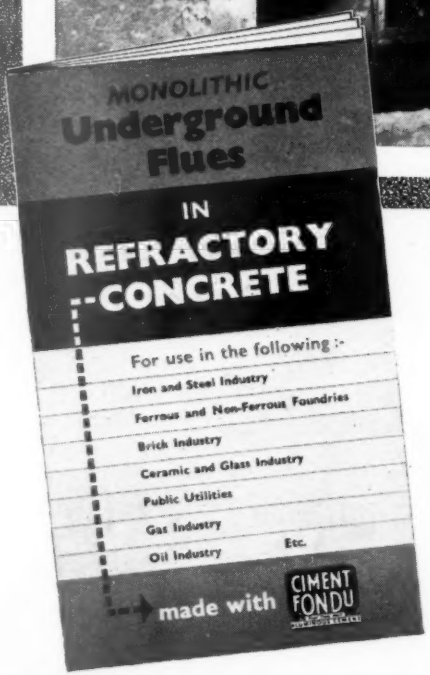
CONTRACTS for over 9,600 freight wagons and 86 passenger vehicles in connection with the railway's modernization plan, have been announced by the British Transport Commission. Firms participating include the Gloucester Carriage & Wagon Company, Limited; Hurst Nelson & Company, Limited; the Birmingham Railway Carriage & Wagon Company, Limited; Pressed Steel Company, Limited; Central Wagon Company, Limited; Edward Curran Engineering, Limited; Metropolitan-Cammell Carriage & Wagon Company, Limited; and Charles Roberts & Company, Limited.

THE COUNCILS of the Iron and Steel Institute and of the Institute of Metals have formed a powder metallurgy joint group, the objectives of which will be to study the science, technology and practice of powder metallurgy. Membership of the joint group will be restricted to members of the Iron and Steel Institute and of the Institute of Metals, though the meetings of the group, as of the two Institutes, will be open to non-members. The inaugural meeting will be held at Church House, Great Smith Street, London, S.W.1, on Wednesday, December 4, 1957, from 10.30 a.m. to 4.45 p.m.

A PARTY of 20 Members of Parliament made a tour of the Austin Motor Company's works at Longbridge on May 29, to study progress being made with automation in the British car industry. Mr. R. Gresham Cooke, M.P. for Twickenham and former director of the Society of Motor Manufacturers and Traders, said that the Austin factory, and those of several other motor firms in Britain, were more fully automated than the Volkswagen plant in Germany which he had recently visited. There had been a certain amount of criticism of the British motor industry on the grounds that it was not up-to-date and the House of Commons party had been persuaded to "go and see for themselves." He considered the Longbridge plant to be as fully automated as any in the world.

MR. N. C. MACDIARMID, of Stanton Ironworks, addressing an education conference, arranged by the Nottingham Chamber of Commerce at Nottingham, on May 24, said that entry into industry was considered by many to be a poor second-best for the brighter boy. He considered that an insufficient number of the country's best brains was attracted to it and the answer was industrial education. Education schemes were costly, but at the Stanton Ironworks their budget was only one-tenth of one per cent. of the total sales turnover value. He added, "We are satisfied that the results far exceed this expenditure," and said that school leavers were attracted by the firms which offered comprehensive training facilities. Sir Edward Boyle, Parliamentary Secretary to the Ministry of Education, appealed to employers to be far-sighted and take advantage of the facilities that were being built up. He urged support of day-release schemes and closer co-operation between firms and colleges.

THREE HUNDRED DELEGATES attended a one-day conference of the Institution of Production Engineers held at Birmingham University Department of Engineering Production. Members agreed that the success of new production techniques may lie mainly with tool design and construction, and it was stressed that the operator must be studied as well as the machine for optimum performance. Mr. H. Burke, joint managing director of Concentric Manufacturing Company, Limited, Birmingham, who opened the conference, suggested that designers should exploit the use of pneumatic and hydraulic mechanisms to the limit and urged increased standardization of tool design. He pointed to the necessity for small firms to keep abreast of the rapid changes in production techniques if they wished to hold their own in the competitive field, and also mentioned that the shortage of trained production engineers in this country was very serious; there was no time to lose in finding a remedy when foreign competitors were anxious to enter UK markets.



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Personal

Sir GEORGE BRIGGS has been appointed to the board of General Refractories, Limited.

Mr. N. L. GOODCHILD has been appointed a director of British Benzol and Coal Distillation, Limited.

Mr. A. JAMIESON has been appointed superintendent, Special Products Division, Canada Iron Foundries, Limited, Hamilton, Ontario.

Mr. W. J. A. GEMMELL, Scottish area manager for the Lancashire Dynamo group, has been presented with a gold watch to mark his completion of 25 years' service.

Mr. S. M. DE BARTOLOME has been appointed chairman and managing director of Spear and Jackson, Limited. Mr. R. D. SAWTELL has been appointed a director of the company.

Mr. ROBERT PATE, pig-iron salesman for the Carron Company, Falkirk, for many years, retired last month owing to ill health. He is succeeded by his assistant, Mr. David C. M. Donaldson.

Mr. HAROLD J. POLLARD has retired as a director and chief development engineer of Bristol Aeroplane Company, Limited. Mr. Pollard, who is 65, has been with the Bristol group for 35 years.

Mr. WILLIAM BAKER, Midland area manager for Herbert Morris, Limited, lifting and transporting machinery manufacturers, of Loughborough (Leics), has retired after 43 years with the firm.

Sir WALTER PUCKEY, has joined the board of Black and Decker Limited. Mr. F. W. MCCARTNEY, assistant general manager, becomes assistant managing director, and Mr. W. O. BELL, acting production director, becomes production director of the company.

Mr. W. E. BULLOCK has relinquished his executive position as production director of Guy Motors, Limited. He has, however, accepted the position of consultant engineer and remains a director of the company and its subsidiary, the Sunbeam Trolley Bus Company.

Mr. ROBERT CARSWELL has resigned his position as technical director of Foundry & Engineering Products Company (Glasgow), Limited, and has formed his own company, Caro Foundry Products, Limited, 172, Brownside Road, Burnside, Rutherglen, Glasgow.

The retirement is announced of Mr. ARNOLD PEARCE, who, in addition to being a director of Birmid Industries, Limited, is also managing director of the Midland Motor Cylinder Company, Limited, Smethwick, and chairman of the Dartmouth Castings Company, Limited, Smethwick.

Mr. JAMES D. PRIESTMAN, sales director of Priestman Bros., Limited, crane and excavator manufacturers, of Hull, and Mr. ARTHUR WILKINS, director and secretary, are going to Canada to establish the Canadian company of Priestman Bros., and to purchase a site for a new depot near Toronto.

Mr. PHILIP BACHE, managing director of Geo. Salter & Company, Limited, West Bromwich, has been elected president of Birmingham Chamber of Commerce for 1957/58. He succeeds Mr. J. E. Belliss, managing director of Belliss & Morcom, Limited, whose father preceded Mr. Bache's uncle in the presidency of the Chamber 27 years ago.

Mr. LESLIE GAMAGE has accepted the appointment of president of the Institute of Export for the 15th consecutive year. Vice-chairman and joint managing director of the General Electric Company, Limited, he is a director of the Pirelli General Cable Works, Limited, the Steel Conduit Company, Limited, and Siemens & General Electric Railways Signal Company, Limited. Mr. Gamage is also associated with a number of other companies.

Following a decision by the Steel Company of Wales to reorganize their research on a divisional basis Mr. A. J. K. HONEYMAN, B.SC., F.I.M., has been appointed superintendent of research for the steel division. He will continue to exercise supervision over the steel division's chemical and metallurgical department through the chief metallurgist, Dr. C. S. BALL, B.MET., PH.D., A.I.M., who has been appointed to this post in succession to Mr. Honeyman.

Major W. R. BROWN, D.S.O., has been appointed chairman and managing director of the Power Gas Corporation, Stockton-on-Tees, in succession to the late Dr. N. E. Rambush. Major Brown who has been associated with the company for 30 years, was appointed to the board in 1942, and elected vice-chairman last year. He is well known in the iron and steel industry for his work in connection with the design and construction of modern blast furnaces.

Obituary

Mr. ERIC ROSEWARNE FRY, deputy chairman of Brooke Marine, Limited, shipbuilders, of Lowestoft, has died at the age of 62. Mr. Fry, who was appointed general manager of the company in 1941, became deputy chairman two years ago.

Mr. G. E. SWAFFIELD, whose death is announced at the age of 57, had been for the past 10 years chairman and managing director of the Albany Engineering Company Limited, of Lydney, a firm with which he had been connected for 30 years. A member of the Engineering and Allied Employers, West of England Association, he was specially interested in technical education for apprentices.

The death is announced, on May 26, of Mr. L. WOODCOCK, former sales manager of the industrial and marine units division of Leyland Motors Limited. Mr. Woodcock joined the company in 1925 and spent many years in the engineering division. In 1947 he was appointed India and Burma manager and returned to this country in 1949, later being appointed to the industrial and marine units division.

Yugoslavia Exporting Steel

The Sisak iron and steel works, Yugoslavia, has begun to export seamless steel tubes, rolled steel tubes for scaffolding, and ingot moulds, to western as well as to eastern Europe. Production by Sisak of seamless tube, the main export product, was 27,000 tons in 1956, of which 9,500 tons was exported to the United States for oil well casing or tubing. Some also went to the United Kingdom, to Austria, India, East Germany, Bulgaria, and India. Export is planned at about 15,000 tons for 1957 and about half of this is already delivered, according to a report from Zagreb.

Latest Foundry Statistics

It is announced by the Council of Ironfoundry Associations that the number of ironfoundry workers employed in the UK during the week ending March 30 was 138,507. Of these 128,943 were males and 9,564 females. Compared with March 2, the total has declined by 1,326 and with March 31, 1956, by 6,937.

Facts from the record
of Goodyear conveyor belting

STACKER

APPLICATIONS

A super quality belting for use where there is severe and frequent abrasion and flexing. It is ideal for conveying ores, stone, coke, glass cullet and other highly abrasive materials.

PHYSICAL PROPERTIES

Stacker exceeds British Standards Grade "A" in all requirements of fabric and rubber and may be used at temperatures up to 200 deg. F.
Made with the highest grade friction stock between plies for maximum flex-life.
Has the toughest cover obtainable, with the highest possible resistance to cutting, gouging and abrasion.
Completely inhibited against mildew damage.

AVAILABLE

Stacker is available in 28, 32, 36, 42 and 48 oz. duck weights, from 3 to 9 plies and in a full range of widths, lengths and cover gauges.

STYLE ORS

APPLICATIONS

For operations where extreme resistance to oil is necessary. Especially suitable for carrying oil-sprayed co
meat, fish or food where an

PHYSICAL PROPE

STYLE HRS

APPLICATIONS

Specially made for conveying hot, highly abrasive materials when the combination of resistance to high temperatures, extreme abrasion and severe flexing are essential.

PHYSICAL PROPERTIES

The carcass, cover and skim-coating between plies give all the heavy-duty characteristics of a Grade "A"

GOODYEAR
INDUSTRIAL RUBBER PRODUCTS

CONVEYOR BELTING · TRANSMISSION BELTING · V-BELTS · HOSE · FENDERING

Raw Material Markets

Iron and Steel

The outstanding demand for pig-iron continues to come from the steelworks for basic pig-iron, and although they are receiving impressive tonnages, their needs are not yet fully satisfied from home sources and these deliveries have to be augmented with imported iron. A good proportion of current outputs of hematite pig-iron also finds its way to the steelworks.

Several new furnaces are in course of construction or rebuilding in various parts of the country and when these are brought into production on pig-iron for the steelworks, additional quantities will be available to meet the increasing ingot production, and in addition these are expected to reduce the present reliance on deliveries from overseas.

In the ironfoundry trade, apart from the expansion in business in the motor vehicle industry, there is little change in the conditions which have ruled for some time past.

The engineering foundries connected with the motor-car manufacturers continue to benefit from the increased production, and delivery schedules for castings have shown a marked improvement, in consequence of which larger tonnages of low- and medium-phosphorus irons and hematite are being called for. The makers of the former irons are now able to dispose of most of their outputs and do not now find it necessary to add to stocks to the same extent as before; in addition to the needs of the foundries supplying the motor-car industry, reasonably good tonnages are being taken up by many other engineering and speciality foundries for high-duty castings for machine tools, agricultural implements, electrical and power-plant equipment, etc. Hematite producers are able to dispose of their outputs without much difficulty and stocks on hand are small.

Refined iron makers have orders on hand for both home and overseas consumers, but are in a position to take on more business for prompt delivery. No supplies of hematite are being exported, and there is only a limited quantity of low-phosphorus iron available.

The furnaces producing high-phosphorus pig-iron find it difficult to distribute present outputs fully to the users of this grade, including the light, jobbing, textile, and some of the engineering foundries. The jobbing and engineering foundries are fairly busy and are taking up reasonable tonnages, but most of the light and textile foundries are only moderately employed.

The furnaces have stocks of high-phosphorus pig-iron on hand and have consignments available for shipment abroad when licences can be obtained.

The re-rollers continue to be fairly well occupied, but orders for small bars and light sections are not being received for the same quantities as before, due mainly to the stocks which are being carried by both consumers and stockists. Pressure is sustained for reinforcing rods, and there is some improvement in the demand for sheets from the motor vehicle trade.

The steel semis supply position has shown a change during the last few weeks at many re-rolling establishments, as in addition to the improved deliveries from home steelworks, appreciable tonnages have been received from abroad. This has brought stocks up to maximum levels, with the result that some establishments have found it necessary to suspend deliveries for a period from home suppliers of all grades and sizes of semis.

Non-ferrous Metals

There have been some important announcements over the last week or so which will affect the outlook for copper both in the near and long term. The long-term factor arises from the joint announcement by Rhodesian Selection Trust and Rhodesian Anglo-American—the two major Northern Rhodesian copperbelt groups—of a copper pricing arrangement. This had been expected for some time. While no details have been released, it is understood that the scheme aims at the establishment of a Rhodesian copper price linked to the LME price, which would be adjusted periodically to take account of fluctuations in the market price. The final arrangements must necessarily depend on agreement with UK fabricators who desire some more stabilized system of pricing. Discussions are continuing and it may be some time before final details are known. The short-term market factor is the 10 per cent. cut-back in production of copper by the copper producers in the Rhodesian Selection Trust group. The total effect of this reduction will be in the region of 18,000 tons of copper per annum, or less than 1 per cent. of world production. Copper producers in the Anglo-American group have not followed suit, nor have the American companies operating in Chile.

Meanwhile, the copper market both here and in New York remains dull. In London the price continues to drift, and following the news of a further increase in stocks to 1,844 tons the price reacted to lower levels. In the US the price structure is unchanged from last week, with the exception of No. 2 scrap which firmed up to 24½ cents, reflecting the paucity of offerings at the lower level.

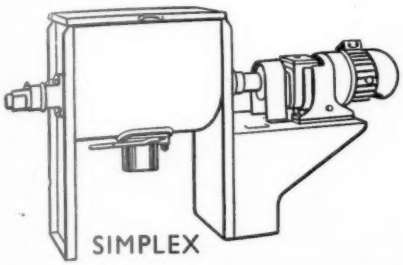
The chief item of interest in lead and zinc has been the announcement of a new long-term minerals programme. This has been presented to Congress and will aim at assisting the US lead and zinc producers by the introduction of a new import excise tax designed to maintain the domestic lead price at 16 cents and the zinc price at 13½ cents a pound. The tax would rise and fall inversely to the market price.

Tin is quietly steady in London and quiet in America, where consumers look upon 98 cents a pound as a floor price, taking into account buffer stock activities. Russian tin continues to be made available in London and on the Continent where reports estimate that 1,000 tons a month are available. Tin stocks in London rose last week by a further 81 tons to 1,844 tons, of which 8 tons were in London and the balance in Liverpool.

SANDWELL CASTING COMPANY, non-ferrous founders, have had plans prepared for the erection of an extension to the diecasting shop at Bank Street, Stone Cross, West Bromwich.

THE YUGOSLAV SECTIONAL MEETING of the World Power Conference is now being held at Belgrade. It is being attended by 63 delegates from the UK, many of whom will be accompanied by their ladies. Of the former no fewer that 27 are attached to State monopolies.

THE COUNCIL OF IRONFOUNDRY ASSOCIATIONS announce that foundry supervisors courses have been arranged as follow: Course No. 7 from July 15 to 19, and Course No. 8 from September 16 to 20. Copies of a leaflet describing supervisors courses are available on writing to Mr. John Collett, training officer of the Association, at 14, Pall Mall, London, S.W.1.



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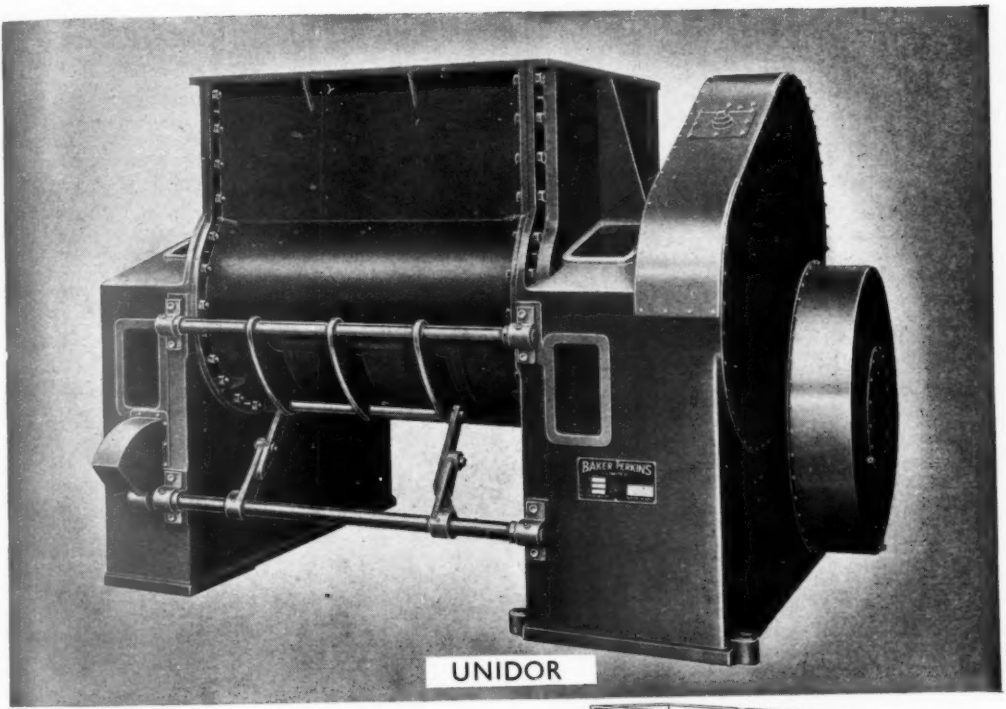
IN A RANGE OF SIZES UP TO 300 TONS AN HOUR



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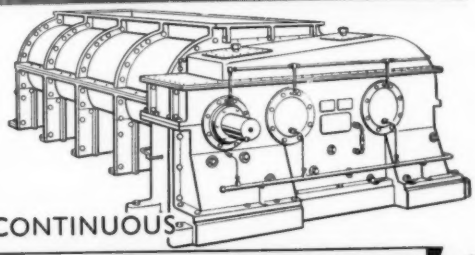
Both "UNIDOR" and "CONTINUOUS" machines subject the sand to perfect milling action between their twin shafted, helical, contra-rotating sigma blades. Other mixers in all sizes are supplied for core sands, pre-coated resin sands and CO_2 mixes



CONTINUOUS

BAKER PERKINS LIMITED

ENGINEERS

WESTWOOD WORKS · PETERBOROUGH

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

June 5, 1957

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £20 1s. 0d.; Birmingham, £19 13s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £21 18s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £22 2s. 3d.

Scotch Iron.—No. 3 foundry, £23 4s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £24 6s. 6d.; South Zone, £24 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £25 14s. 0d.; South Zone, £25 16s. 6d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £22 17s. 6d.; Scotland (Scotch iron), Zone S. 1, £23 4s. 0d.; Sheffield, £24 4s. 6d.; Birmingham, £24 12s. 0d.; Wales (Welsh iron), £22 17s. 6d.

Basic Pig-iron.—£19 3s. 0d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £50 0s. 0d. to £53 5s. 0d., scale 17s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £76 7s. 6d., scale 17s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 28s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 12s. 3d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 11s. 7d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 14s. 7d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £96 0s. 0d. to £99 10s. 0d., basis 60 per cent. Cr, scale 33s. 0d. per unit; over 6 per cent. C, £94 0s. 0d., basis 60 per cent. Cr, scale 31s. 0d. to 33s. 0d. per unit; 2 per cent. C,* 2s. 2d. per lb. Cr.; 1 per cent. C,* 2s. 2½d. per lb. Cr; 0.15 per cent. C,* 2s. 3d. to 2s. 3½d. per lb. Cr; 0.10 per cent. C,* 2s. 3½d. to 2s. 3⅝d. per lb. Cr; 0.06 per cent. C,* 2s. 3½d. to 2s. 4d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—90/92 per cent., carbon-free, £290 0s. 0d.; 96/98 per cent., £310 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 22s. 0d. to 22s. 6d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £82 12s. 6d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £30 9s. 0d.; tested, 0.08 to 0.25 per cent. C, £31 9s. 0d.; hard (0.41 to 0.60 per cent. C), £32 10s. 6d.; silico-manganese, £41 0s. 0d.; free-cutting, £34 13s. 0d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £38 4s. 6d.; silico-manganese, £41 7s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £36 3s. 6d.; basic, hard, over 0.41 up to 0.60 per cent. C, £37 6s. 0d.; acid, up to 0.25 per cent. C, £40 7s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £39 2s. 0d.; boiler plates (N.-E. Coast), £41 12s. 0d.; floor plates (N.-E. Coast), £40 11s. 0d.; sectional material, N.-E. Coast, £37 11s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested (4-ton lots), £37 18s. 0d.; flats, 5 in. wide and under (4-ton lots), £37 18s. 0d.; hoop and strip, £37 17s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £41 6s. 0d.; black sheets (hand mill), 17/20 g., £52 4s. 6d.; galvanized corrugated sheets, 24 g., £65 9s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £65 10s. 3d.; nickel-chrome, £92 13s. 0d.; nickel-chrome-molybdenum, £104 11s. 6d.

NON-FERROUS METALS

Copper.—Cash, £234 0s. 0d. to £234 5s. 0d.; three months, £235 15s. 0d. to £236 5s. 0d.; settlement, £234 5s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 3½d. per lb.; rods, 267s. 3d. per cwt. basis; 20 s.w.g., 300s. 6d. per cwt.

Tin.—Cash, £762 10s. 0d. to £763 0s. 0d.; three months, £759 10s. 0d. to £760 0s. 0d.; settlement, £763 0s. 0d.

Lead (Refined Pig).—First half June, £94 15s. 0d. to £95 0s. 0d.; first half September, £95 0s. 0d. to £95 10s. 0d.

Zinc.—First half June, £76 10s. 0d. to £76 15s. 0d.; first half September, £75 10s. 0d. to £75 15s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £113 15s. 0d.; rolled zinc (boiler plates), all English destinations, £111 10s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £99.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 10⅝d. per lb.; rods, drawn, 2s. 11d.; sheets to 10 w.g., 200s. 9d. per cwt.; wire, 2s. 7⅝d.; rolled metal, 201s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £166; B6 (85/15), £230; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £220; HTB2 (38 tons), £230; HTB3 (48 tons), £247.

Gunmetal.—BS1400, LG2 (85/5/5/5), £220; LG3 (86/7/5/2), £231; G1 (88/10/2/½), £285; (88/10/2/1), £271.

Phosphor Bronze.—BS1400, PB1 (AID released), £305 per ton.

Phosphor Bronze Strip, etc.—Strip, 287s. 0d. per cwt.; sheets to 10 w.g., 287s. 0d. per cwt.; wire, 3s. 11⅞d. per lb.; rods, 3s. 3¾d.; tubes, 3s. 3¾d.; chill cast bars: solids 3s. 3¼d., cored 3s. 4¼d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 10d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 2¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 1¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £88 10s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £197 0s. 0d.; aluminium bronze (BS1400), AB1, £256; AB2, £286.

* Average 68-70 per cent.